

MAPSPROG Version 2.0

USER'S GUIDE AND MANUAL

An input/import/verification/edit program for MAPS data
for Windows 3.1 or higher or Windows 95

programmed by

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in cooperation with, and following specifications provided by

The Institute for Bird Populations
Monitoring Avian Productivity and Survivorship (MAPS) Program

User's Guide and Manual prepared by

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Appendix A: MAPSPROG Version 2.0

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PART I: USER'S GUIDE TO MAPS DATA VERIFICATION

I. BEFORE YOU START

Read this guide first. You must understand this information before you execute and use MAPSPROG.

II. WHY VERIFY MAPS DATA?

There are two important reasons why MAPS data must be verified. The first is obvious--to make the data collected by the MAPS Program as accurate as possible. Inaccurate data will lead to erroneous indices and estimates of adult population size, post-breeding productivity, adult survival rates, and recruitment rates into the adult populations. Erroneous indices and estimates will, in turn, lead to erroneous conclusions and, ultimately, to erroneous suggestions as to the proximal causes of population declines. Inaccurate data also will lead to inappropriate recommendations for future research and management strategies designed to stabilize and reverse trends of those landbird populations that are declining, and to enhance trends for those populations that appear to be stable but are potentially threatened because of small population size or limited range or habitat requirements. Erroneous data also will make data analysis difficult or impossible. All of our analytical programs require properly coded data; improperly coded data generally cause the analytical programs to crash.

From an analytical standpoint, therefore, the accuracy of the following determinations in each data record are crucial and must be verified: capture code; band number; species code; age; how aged; sex; how sexed; date, time, and location of capture (including net number); and disposition (i.e., whether the bird was released alive and in such a condition that its future survival was not compromised). We refer to these determinations as the **primary MAPS data**, the data upon which all of our subsequent analyses depend. These data fields are the ones that may be subject to modification based on other information provided during that capture and comparisons with other records of the same band number. In addition, MAPS operators are also asked to collect **supplemental data**, including: skull pneumaticization; breeding condition (cloacal protuberance and brood patch); molt, wear, and plumage status (body molt, flight-feather molt, primary feather wear, juvenal plumage); wingchord; fat and weight. The major purpose for collecting this supplemental information is to provide a means for verifying the accuracy of the species, age, and sex determinations. These supplemental data, if collected accurately and in a standardized manner, also can provide invaluable information as to spatial (geographic) and temporal variation in the timing and extent of breeding and molt and the physiological condition of the bird. Finally, these data fields, reflecting information taken directly from the bird in hand and without other information to validate their accuracy, should **not** be modified, but should mirror precisely what is on the field data sheets.

The second reason for verifying MAPS data is to provide a means for estimating the kinds and numbers of errors that may exist in the MAPS data set after verification. As will be elaborated later, one of the important steps in data verification is called between-record consistency. This step checks that records sharing a given band number do not change species or sex or regress in age. As you will see when you run the program, this step detects potential errors in band number, species, age, and sex determinations, as well as code (C), status, and station errors. In order to detect these errors, however, the bird wearing a given band number must be recaptured at least once. Because not all birds banded in the MAPS Program are recaptured (in fact, only about 30% of the adult birds and somewhat less than 10% of the young birds are ever recaptured), only a relatively small proportion of the actual errors will ever be detected. However, the proportion of errors actually detected through the between-record verification routine, compared to the proportion of birds ever recaptured, will allow us to estimate the number of errors that may remain in the data set after verification. This information is fundamental for assessing the precision of our indices and estimates. Equally important, this information allows us to track the error rate over time and to evaluate the effectiveness of efforts designed to improve the accuracy of the data.

III. WHY SHOULD MAPS CONTRIBUTORS VERIFY AND EDIT THEIR OWN DATA?

Again, there are two important reasons why MAPS contributors should verify and edit their own data. First, MAPS contributors know more about their data than anyone else: the circumstances under which they were collected, how the dynamics of life-cycle patterns in that particular season affected them, and the experience and skills of their field personnel. Thus, MAPS contributors will be able to do a more accurate and efficient job of verifying and editing their data than anyone else. IBP biologists, as second parties verifying and editing the data, often have questions regarding data conflicts that may arise. Obtaining answers to these questions can, at times, be difficult and time-consuming, especially if, in verifying the data from approximately 450 stations, the verification of a given station's data does not occur until late in the winter or early spring. Many times, the biologist performing verification at IBP has to make a decision as to which of two or more conflicting criteria holds more validity; this decision often has to be made without any insight as to the experience and skill of the field personnel who collected the data. We believe that most of the decisions we make in such cases are appropriate but acknowledge that our verification of MAPS contributors' data can, at times, introduce new errors into the data. Because you, as a MAPS contributor, know more about your data than anyone else, you are in a much better position than we to make informed and timely decisions regarding conflicts that arise.

The second reason you should verify your own data is to provide you with the opportunity to see, firsthand, the actual and potential errors that you may be making and, thus, to provide you with the means for improving the quality of your data. When you verify and edit your own data you will encounter the same errors and conflicts in your data that IBP

biologists encounter when verifying your data. We hope that such encounters will encourage you to identify, examine, and improve those data collection techniques that you or your field personnel use that may contribute to the errors and conflicts encountered. Such self-improvement in data collection can result only in better data.

IV. THE OVERALL STRATEGY FOR VERIFYING AND EDITING MAPS DATA

The strategy for verifying and editing MAPS data has three components. In MAPSPROG, the first two components are accomplished in one procedure. The first component is to verify the *proper coding* of all data entered or imported into MAPSPROG. This is straightforward: MAPSPROG holds a listing of all valid codes for each of the fields in the database and, for each field, compares the codes entered or imported with those listings. If MAPSPROG encounters an invalid code, it will display an error message, and the error must be corrected. The program will not allow you to continue on to the next procedure as long as invalid codes remain in the data. Such an error, one that prevents you from continuing, is called a **critical error**. All invalid codes constitute critical errors.

The second component of the verification and editing process is to verify the *within-record consistency* of the data. In this step, various supplemental data for a given record are compared to the determinations of the primary data for that record to ensure within-record consistency. For example, skull pneumaticization is compared with age determination (e.g., an adult (AHY) bird generally should have a 5 or 6 skull, while a young (HY) bird generally should have a 0 through 4 skull during the MAPS season); cloacal protuberance and brood patch are compared with both age and sex determinations (e.g., a bird with a 3 CP generally should be an AHY male, while a bird with a 3 BP generally should be an AHY female); etc. All within-record discrepancies encountered are flagged and error or warning messages are displayed. Most within-record discrepancies are considered **non-critical errors**; that is, MAPSPROG will allow you to go on to the next step even if within-record discrepancies exist. The rationale for this is that, presumably, you have corrected the primary determinations (BAND, SPEC, AGE, HA, SEX, HS) based on your consideration of all the supplementary data for that record together; conflicts may, nevertheless, remain in the data set. However, supplemental data that conflict with age or sex determinations, but are listed as ageing or sexing criteria, are considered critical errors as well. For example, if for a given bird you determine AGE= 1 and the bird has SK= 0, you are really ageing the bird adult *despite* its skull. Therefore, it should not be aged by skull, i.e., HA should not contain S. If HA does include S in such a case, MAPSPROG will prevent you from moving on to the next step because such conflicts are considered critical errors. Similar situations arise with other supplementary data and both pairs of fields: SEX and HS as well as AGE and HA. In the absence of a note explaining the reason for the conflict, you must make a decision whether to retain the conflict and delete the offending HA or HS criterion, or to change the AGE or SEX to conform to the SK or CP/BP field data based on all the evidence available to you. You must not, of course, modify valid supplementary data collected in the field.

The third component of the verification and editing process is to verify the *between-record consistency* of the data. In this component, the code (C), species (SPEC), age (AGE), sex (SEX), status (STATUS), and station (STATION) determinations are compared for each sequential pair of records having the same band number (BAND), and any discrepancies in these fields are flagged and an error message is displayed. Discrepancies in SPEC, AGE, or SEX are critical errors and must be corrected or marked before a verified file can be created. However, you should note that when you change one of the two records flagged to make these fields consistent between the two records, a new inconsistency may result between the changed record and another previous or subsequent record for the same band number.

Finally, it is extremely important to note that **all SUPPLEMENTAL DATA taken in the field (i.e., skull pneumaticization, cloacal protuberance, brood patch, fat, body molt, flight-feather molt, flight-feather wear, juvenal plumage, wingchord, and weight) must NEVER be changed at any time during the verification process.** This is crucial because, if a subsequent between-record verification step finds a discrepancy, it will be very important to know what the supplemental data, **as taken in the field**, actually were. For example, assume that a given record had a skull pneumaticization of 0, a cloacal protuberance of 1, and an age of 1 (AHY). The within-record component will identify and flag the discrepancy between SK= 0 and AGE= 1. In editing this record, you might trust the CP= 1 more than the SK= 0 and decide that the bird really was an adult. If so, you should **not** change the skull to 6. Now assume that you recaptured this individual on a subsequent MAPS visit, and that the data for that record were SK= 0, CP= 0, and AGE= 2 (HY). If you had changed the SK of the first record to 6, you would have two records showing conflicts between SK and CP, and would have no indication as to which to trust. The fact is, however, that SK actually was coded 0 in the field on both occasions and CP was coded 0 once and 1 once. Thus, the weight of the evidence clearly points to the bird being AGE= 2. For this reason, the **supplementary data always must reflect what was taken in the field, and you must never change supplementary data** (unless, of course, the supplementary data involved a data entry error and you changed it to reflect what was actually taken in the field).

22. A NOTE ON THE FILE STRUCTURES USED IN MAPSPROG AND SOME EXAMPLES

In progressing through the verification process, MAPSPROG passes your data through three data files called RAWMAPS.dbf, TEMPMAPS.dbf, and NEWMAPS.dbf (for simplicity, the User's Guide and Manual will hereafter refer to these files as RAWMAPS, TEMPMAPS, and NEWMAPS, respectively). RAWMAPS is the file into which the raw data is entered or imported; TEMPMAPS is the file in which MAPSPROG conducts the first two components of verification, proper coding and within-record consistency checking; and NEWMAPS is the file

in which MAPSPROG conducts the final component of verification, between-record consistency checking (see Section IV).

These three files make use of two file structures that are closely related: the MAPS banding-data file structure and the MAPS data-analysis file structure. You are undoubtedly familiar with the MAPS banding-data file structure, as it has been evolving with the MAPS Program since its inception and closely reflects the MAPS data sheets. This is the structure used by RAWMAPS; the current, 1998 structure is presented in Appendix I to this Manual. The MAPS data-analysis file structure used by TEMPMAPS and NEWMAPS is similar to the banding-data structure in that all the fields present in the banding-data structure are also present, in essentially the same order, in the data-analysis structure.

It differs from the banding-data structure in that it includes several additional fields. The file structure for the MAPS data-analysis file is presented in Appendix II, and Appendix III provides a list of and definitions for each of the valid codes that may appear in each field of the MAPS banding-data and/or data-analysis files. Many of the additional fields in the MAPS data-analysis file are used only for data preparation and/or data analysis and need not concern you. A few of the additional fields, however, are critical for data verification and editing, and you must understand how they work. These include original band number (OBAND), original species (OSP), original age (OA), original how-aged (OHA), original sex (OS), and original how-sexed (OHS). These fields are used whenever it becomes necessary to change determinations in the respective band number (BAND), species (SPEC), age (AGE), how-aged (HA), sex (SEX), or how-sexed (HS) fields. In such cases, the original determinations, taken in the field, are entered automatically by MAPSPROG into the respective original (e.g., OA) fields. Once an entry is made in any of the original fields, it must never be changed, and, indeed, MAPSPROG will not allow you to change it, because it represents the determination made in the field. Moreover, if at a later time it was found that the original determination was correct, the data in the original field would not be changed or deleted because its presence indicates that at some time there was a different determination made for this record.

These original fields are used as follows. Assume a bird (e.g., a Song Sparrow) was captured in July with no trace of

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juvenal plumage but for which the extent of skull pneumaticization could not be determined. The bird was given AGE= 0 and HA= . Now assume that the bird was recaptured about 10 days later and, because the skull appeared to show no pneumaticization (SK= 0), the bird was given AGE= 2 and HA= S . The between-record verification routine of MAPSPROG will present these two records for correction because of the age discrepancy. In editing the data you might trust the second skull pneumaticization code and thus decide that the bird was a HY bird. The two records would then appear as:

First capture: OA= 0 ; OHA= ; AGE= 2 ; HA= R ; and
Second capture: OA= ; OHA= ; AGE= 2 ; HA= S .

Note that when you change AGE of the first record, MAPSPROG will automatically place the original age and how-aged determinations in OA and OHA of the first record, respectively, and will automatically place an R in the HA field of the first record to indicate that the age determination of that record was derived from recapture information.

Alternatively, you might not trust the second skull pneumaticization code of 0 and thus decide that the age of this individual must really remain unknown. In this case, the two records would be:

First capture: OA= ; OHA= ; AGE= 0 ; HA= ; and
Second capture: OA= 2 ; OHA= S ; AGE= 0 ; HA= R .

In this case, MAPSPROG will automatically place the original age and how-aged determinations in OA and OHA of the second record, respectively, and will automatically place an R in HA in the second record, again to indicate that the age determination for this record relied on recapture (actually, previous capture) information.

Now assume that this Song Sparrow was captured a third time in a subsequent visit and this time the skull appeared to be completely pneumaticized (SK= 6). Now, when editing the data, you might decide that you can trust this third skull

code because (presumably) the minute dots characteristic of a fully pneumaticized skull were seen and you believe that the SK= 0 determination made on the second capture was in error. Thus, you believe that the bird was an adult all along. The three records would now appear as:

```
First capture: OA= 0 ; OHA=   ; AGE= 1 ; HA= R  ;
Second capture: OA= 2 ; OHA= S  ; AGE= 1 ; HA= R  ; and
Third capture: OA=   ; OHA=   ; AGE= 1 ; HA= S  .
```

Alternatively, because of the conflicting skull information, you might decide not to trust either of the skull determinations. In this case, the three records would appear as:

```
First capture: OA=   ; OHA=   ; AGE= 0 ; HA=   ;
Second capture: OA= 2 ; OHA= S  ; AGE= 0 ; HA= R  ; and
Third capture: OA= 1 ; OHA= S  ; AGE= 0 ; HA= R  .
```

This example illustrates three points: first, that you need to see all capture records for a given individual to make the best BAND, SPEC, AGE, or SEX determinations; second, that retaining and displaying the original, in-the-field determinations is crucial for making the most accurate determinations; and third, that the final BAND, SPEC, AGE, and SEX determinations must be consistent for all records of each individual. The reason for this last requirement is that calculations of productivity indices and annual survivorship estimates typically make use of only the first (or, in some transient-model survivorship calculations, the first and second) capture records of each individual each year. Thus, it is imperative that all records for a given individual reflect the final, most accurate, BAND, SPEC, AGE, and SEX determinations for that individual. This last point means that when you encounter a between-record discrepancy in SPEC, AGE, or SEX, you must examine all records for that individual and change all records that do not agree with your final determination.

It should also be pointed out that placing an R in HA or HS provides a means for tracking the errors that were detected through the between-record verification process and, subsequently, for determining the remaining, after-verification error rate for AGE and/or SEX in your data set. Because MAPSPROG automatically places an R in HA or HS when AGE or SEX is changed as a result of

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between-record verification, you do not need to be concerned with these R s.

Between-record errors in BAND and SPEC are tracked by means of five additional fields, V1, OV1, VYR, OVYR and N, that are a part of the data-analysis file structure. Whenever MAPSPROG encounters a discrepancy between species determinations in two sequential records for the same band number in a given year, it automatically places an 'SP' in the V1 field for both records. If, in editing the data, you change the species determination in one of these records, MAPSPROG will automatically place the original SPEC determination in the OSP field for that record. Thus, if OSP and SPEC differ for a given record, and 'SP' occurs in the V1 field, then we know that a species determination error was made for that record and that the error was caught by the between-record verification process.

If, on the other hand, you decide that the species determinations were correct for both records, but that the band number was misread for one of the two records (which could cause the apparent species discrepancy), and if you are able to determine what the actual band number was, you should replace BAND for that record with the correct band number. MAPSPROG will then automatically place the originally-recorded band number in OBAND, and will overwrite the SP in the V1 field with BN, thus indicating that the between-record discrepancy in SPEC was caused by a misread band number, rather than by an error in species determination. As an aside, you should note that MAPSPROG also places A, S, ST, or SS code in V1 if it encounters between-record discrepancies in AGE, SEX, STATION, or STATUS, respectively; however, if it previously encounters a species discrepancy, the SP will be retained in OV1 and the new tracking code will be saved in V1. The actual checking hierarchy for error tracking is 2 (two newly banded records for the same band number or two recaptures of the same band number with the same date, time and net), BN, DL (destroyed/lost band and a captured bird with the same band number), SP, NM (species sequence number [NUM] discrepancy), A, S, ST, and SS. Again, however, you need not concern yourselves directly with the V1 codes as MAPSPROG enters them automatically. In addition, analogous fields in the MAPS data-analysis file structure (VYR and OVYR) are used for flagging between-year discrepancies.

In other situations where a SPEC discrepancy exists (caused either by a species misidentification or a misread band

number), you may be confident of one of the two records (because of other corroborating recapture data), but be unable to determine the correct band number or species for the other record. In such a situation, the N field of the record for which species or band number is in error must receive a ?. The ? in the N field flags the record so that it is not included in any of our analyses of productivity or survivorship. MAPSPROG provides a simple routine for inserting these ?s into the N field.

In yet other situations where a species discrepancy exists, you may not be able to determine whether the discrepancy was caused by a misread band number or a species misidentification, or even which of the two SPEC codes was correct. For example, suppose a given band number was recorded as being placed on a HY Song Sparrow in juvenal plumage; the only other record of that band number was recorded as being recaptured a week later on a HY Lincoln's Sparrow also in juvenal plumage; several HY Lincoln's Sparrows also in juvenal plumage were banded from the same string of bands, and the wingchord that was recorded for both conflicting records fell in the overlap zone between the two species. At least three scenarios are possible and, perhaps, equally likely for the two conflicting records of that band number: (1) the band numbers were read correctly but both encounters were of a Song Sparrow; (2) the band numbers were read correctly but both encounters were of a Lincoln's Sparrow, or (3) both species determinations were correct but the band number of the recapture was misread. Because you cannot be confident of the species determination for either record of this band number (nor be confident of the band number of the recapture record), the N field of both records must receive a ?.

The important point here is that you must not leave a between-record AGE or SEX discrepancy in your final verified and edited database unless a SPEC discrepancy also exists between the two conflicting records; and, furthermore, you must not leave a SPEC discrepancy in the final verified and edited database unless one or the other (or both) of the conflicting records has a ? in the N field. Fortunately, MAPSPROG provides a simple routine to enter these ?s.

VI. GENERAL PROCEDURES FOR USING MAPSPROG

Using MAPSPROG is very much a step-by-step process. Each step creates and works on a new file of your data, named sequentially RAWMAPS, TEMPMaps, and NEWMAPS. As you

transfer data from one file to the next, you can elect to replace or append to data already in the destination file. A synopsis of the steps involved is provided in the following outline.

A. Enter or Import Data

You have the option of entering data directly into the program or of importing data from another database. Either way you are putting data into a file called RAWMAPS.

1. Entering data:
 - a. Enter single location code and year for data set.
 - b. Enter data record by record into RAWMAPS.
 - c. Print data for proofing.
 - d. Proof data and correct errors.
 - e. Check banding dates against summary of effort data sheets.
2. Importing data:
 - a. Prepare the database to ensure that the data are imported properly.
 - b. Import data directly into RAWMAPS.
 - c. Print data for proofing.
 - d. Proof data and correct errors.
 - e. Check banding dates against summary of effort data sheets.
3. Transfer data in RAWMAPS to the within-record consistency verification file, TEMPMAPS.

B. Verify Within-Record Consistency of Data in TEMPMAPS

1. Display messages identifying ways data collection techniques could be improved.
2. Run the within-record verification routine.
 - a. Working on TEMPMAPS, MAPSPROG will generate a list of error and warning messages for all critical errors and all non-critical discrepancies. View the lists of error and warning messages both in summary form and record-by-record on the screen and/or by printing.

b. Address each message, record-by-record, and correct all critical errors (invalid codes and critical discrepancies) as well as any non-critical discrepancies in need of correction in the Process within-record consistency errors menu item. Remember, MAPSPROG will not allow you to proceed until all critical errors have been purged.

3. Transfer data in TEMPMAFS to the between-record consistency verification file, NEWMAPS.

C. Verify Between-Record Consistency of Data in NEWMAPS

1. Append data files(s) from previous years to create a complete MAPS data file for your location.

2. Adjust records in database for all changed and added bands.

a. Make sure all records of changed and added bands are listed correctly in the database.

b. Enter old and new band numbers for changed bands and the two band numbers for added bands to enable the computer to make the appropriate adjustments to the records.

3. Check all records for which there are only recaptures in the data file.

a. Using the menu option, List Bandnumbers for which there are only recaptures, produce a list of band numbers that have no N -coded record.

b. Review the list of band numbers generated and compare against band numbers in your banding schedules and band inventory; band numbers not accounted for may be misread band numbers.

c. Correct any numbers found to be in error or mark them as questionable.

4. Check all recaptures that predate their original banding record.

a. Using the menu option, List Recaptures that predate their new record, produce a list of band numbers for which recaptures predate their original banding record.

- b. Review the list of band numbers generated and identify the source of the problem by checking raw data sheets and your band inventory. These problems may also be misread band numbers.
 - c. Correct any numbers found to be in error or mark them as questionable.
- 5. Run the between-record consistency routine.
 - a. MAPSPROG will generate a list of error messages for all discrepancies in C (code), SPEC, AGE, SEX, STATUS or STATION in records sharing the same band number. View the list of error messages both in summary form and by band number on the screen and/or by printing.
 - b. Address all of the between-record error messages using the Edit records in NEWMAPS for between-record consistency menu option and make all necessary changes.
 - c. Re-verify all records sharing a band number until all between-record discrepancies have been addressed and purged.
 - d. Mark any records for which the species or band number remain questionable.
 - e. Delete any duplicate records from NEWMAPS.

D.Create a dBASE File for Submission to IBP and a Data File for Your Own Use

You will be able to save the final verified and edited output file for your own use either as a dBASE file or as an ASCII text file in comma-delimited or columnar (SDF) format. This will aid you in importing the file back into any other application you may be using.

E.Five Important Rules to Remember

Now that you have a good general understanding of the entire MAPSPROG input/import/verification/editing procedure, we would like to provide five important rules to guide your use of the program. Please make sure that you thoroughly understand each of these rules and commit them to memory.

First, the program operates strictly step-by-step. **You must not go on to a subsequent step until the previous step is completed.** The reason for this is that each major step involves the transfer to and use of a new data file. You can transfer data from TEMPMaps forward to NEWMAPS, but there is no way to transfer data from NEWMAPS back to TEMPMaps. For example, if you go on to the between-record verification step before you complete the within-record verification step, you will be making your between-record edits in NEWMAPS. Then, if you go back to the within-record step, you will be working in TEMPMaps. If you then transfer the data from TEMPMaps to NEWMAPS, you will overwrite the changes you previously made in NEWMAPS and will have to do the between-record verification step again.

Second, supplementary data (SK, CP, BP, F, BM, FM, FW, JP, WNG, WEIGHT) taken in the field **MUST NEVER BE CHANGED OR DELETED AT ANY TIME OR DURING ANY EDIT** (unless, of course, the erroneous supplementary data resulted from a data entry error).

Third, you do not necessarily have to make a change in the primary data fields (BAND, SPEC, AGE, HA, SEX, HS) should a within-record conflict arise. You should only change the determinations in these primary data fields when the weight of evidence indicates that the determination was in error. For example, consider a bird aged hatching-year (HY) by juvenal plumage (JP= 2 ; HA= J), that also was given a cloacal protuberance of 2. Because of the conflict between AGE= 2 and CP= 2, this record will be flagged in the within-record verification routine as a non-critical error. The CP and JP designation, however, must not be changed. The age of the bird, therefore, may either be changed to unknown (JP= 2 conflicts with CP= 2); changed to an after-hatching-year (AHY) bird (CP= 2 is trusted more than JP= 2, or additional molt, wear or skull information supports the AHY designation); or not changed at all (JP= 2 is trusted more than CP= 2, or additional molt, wear or skull information supports the HY designation). The point of this example is to show that you do not necessarily have to change a primary data determination because of a within-record conflict (see also critical errors discussion in Section IV).

Fourth, if a between-record discrepancy in SPEC, AGE, or SEX is found, you must make a change in at least one of these fields, or use the program to place a ? in the N field of at least one of the conflicting records. Stated another way, you may not leave a between-record AGE or SEX discrepancy in your final verified and edited database unless a SPEC discrepancy also exists between the two conflicting records; and, furthermore, you may not leave a SPEC discrepancy in the final verified and edited database unless one or the other (or both) of the conflicting records has been marked with a ? .

Fifth, you must make all changes to the data in uppercase letters.

PART II: USER'S MANUAL: DETAILED INSTRUCTIONS FOR USING MAPSPROG

GETTING STARTED:

A.Requirements for Running MAPSPROG

In order to run MAPSPROG, your computer must have the following specifications:

1. It must run Windows 3.1, 95, or 98.
2. It must be an IBM-compatible 486 (Windows 3.1) or Pentium equivalent (Windows 95/98). We recommend a Pentium 75 or faster for Windows 3.1 or Pentium 90 for Windows 95/98.
3. It must have at least 15 megabytes of free hard-disk space to execute the program, plus an additional amount of free hard-disk space equal to five times the size of your file in order to upload your data and run it through the program.
4. It must have a minimum of four megabytes of RAM for Windows 3.1 (eight megabytes recommended), or eight megabytes of RAM for Windows 95 (16 megabytes recommended), or 16 megabytes of RAM for Windows 98.
5. Due to intensive processor use we strongly recommend that you do not run additional programs while MAPSPROG is processing records.

B.Installing the Program

1. If any Windows programs are running, shut them down by pressing Alt + Tab to switch to the other applications and close them.
2. Insert Diskette #1 into your disk drive or the CD-ROM into your CD-ROM drive.
3. For Windows 3.1: in the Program or File Manager choose Run from the File menu. For Windows 95 or 98: choose Run from the Start menu.

4. In the Run window, type A:\SETUP (A: is the drive letter for the diskette or CD-ROM drive) and click OK or press Enter. This initiates the installation process.
5. A window appears requesting that you dedicate a directory for the program and its associated files; the default directory name is IBP. Click Continue, then Install in the next dialogue box. Program installation from CD-ROMs proceeds to completion at this point. To complete installation from diskettes, follow the on-screen directions, inserting the remaining diskettes as requested. Once installation is completed, click OK in the Setup Notification box; a MAPSPROG group with a MAPSPROG icon is created automatically (on some computers running Windows 98, the group may hide the Setup Notification box; minimize or move the group to access the box). To start the program, double-click on the MAPSPROG icon.
6. To uninstall the program, delete files in the IBP directory and LANGDRV subdirectory.

3. Preparing to Run MAPSPROG

Before you activate the program:

**Set default
printer**

1. Select your desired printer as the default printer in Windows: in Windows' Main window, double-click on the Print Manager ; click on (highlight) the printer of your choice; then select Set Default Printer in the Printer drop-down menu..

Caps Lock

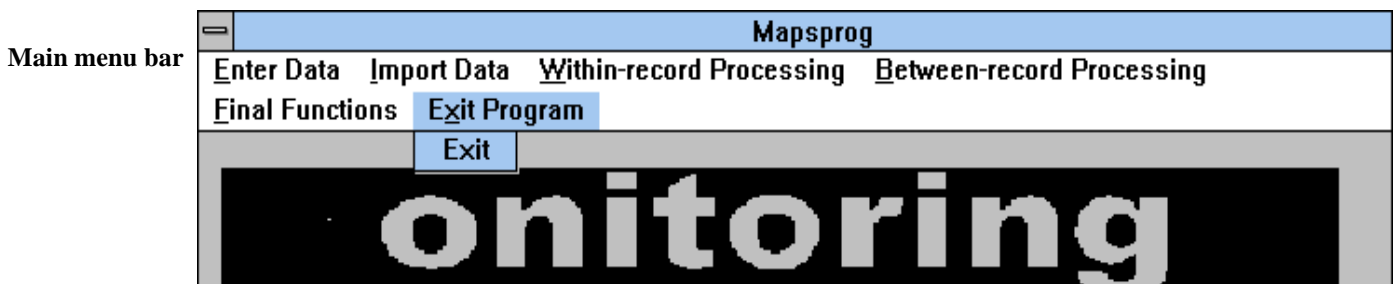
2. Set Caps Lock on. All data must be entered in uppercase letters.
3. Be aware that on-screen help features are not currently embedded in the program. This manual is the current Help function. If you require further assistance with problems in running the program, please call our MAPSPROG hotline (415) 663-1436 and ask for Pilar Velez or Dan Froehlich (pvelez@birdpop.org or dfroehlich@birdpop.org).

Trouble-shooting and program alerts

4. You may encounter bugs in the program. Often, they will be identified as a Program Alert on-screen, with options to ignore or cancel. Canceling will close the program, which is fine because, at most, only your last record (in data entry) or most recent operation will be lost. Often, these alerts are the result of re-accessing a window previously opened. Re-enter the program and try the procedure again, making sure you have each window open only once. If there is no way around the problem, make a note of the problem as identified in the header of the program alert, record the file, the line number, and the context that produced the error. Letting us know these four items will greatly assist us in correcting the problem quickly.

D. Running the Program

Double-click on the MAPSPROG icon to start the program. When you start the program, the following MAPSPROG window appears (cropped in this image), showing the main menu bar containing six drop-down menus (as a demonstration, the sixth one is highlighted and includes only the one option shown) along with part of the background screen.



Using drop-down menus

The precise arrangement of the drop-down menus on your screen varies, depending on the size of the screen and resolution. The window can be moved by clicking on the control box in the upper left-most corner, selecting **Move**, and click-and-dragging the colored (shaded) title bar at the top of the window or using the arrow keys to move the program box to the desired position. The program is Windows-based, so many operations that may be familiar to you from other programs function similarly in MAPSPROG. For example, drop-down menu items may be selected either with the mouse or by using the keyboard: pressing the **Alt** key together with the letter underlined in the desired drop-down menu calls up the menu. Also, some of the menu items have sub-menus; it is not necessary to hold down the mouse button to display the sub-menus. To make a selection, you always have the option of using the mouse or the **Enter** key. To select items in drop-down menus from the keyboard, use the arrow

keys or **Alt** with the letter underlined in the menu listing. To move from one button to another in the various dialogue boxes, use the **Tab** key.

The drop-down menus are arranged sequentially, so that you will generally progress through them from left to right and within each menu from top to bottom. The first step in the program, however, getting your data into RAWMAPS, the program's initial database that holds the raw data as it appears on the data sheets, can be achieved with either of the first two drop-down menus, **Enter Data** for those with field data sheets or **Import Data** for those who have already computerized their data.

DATA ENTRY

1. Entering Location Code and Year

To initiate data entry, select **Enter Data (Add Records)** from the **Enter Data** drop-down menu. To avoid repeatedly entering the same Location code and year, the first screen that appears allows you to enter the Location code and the year (4-digit) for your entire data set.

To prevent accidental miskeying of the location code, the screen also requests that you verify your Location code; discrepancies are brought to your attention and must be corrected. Once you have entered the year, click on the **Go to Data Entry** button or simply press **Enter** to proceed to the data entry screen.

If RAWMAPS already contains data, the Location-verification box gives you the option to append the

The image displays two sequential screenshots of the MAPSPROG data entry interface. Both screens have a light gray background and a blue status bar at the bottom that reads "Add Data to RAWMAPS".

The top screenshot shows the initial data entry screen. It features three input fields arranged horizontally: "Location" with the text "DENA", "Location Verify" with the text "DENA", and "Year" with the text "1998". Above these fields are two buttons: "Go to data entry" on the left and "Return to Main Menu" on the right.

The bottom screenshot shows the same interface but with an additional button, "Append records", located above the "Location" field. This indicates that the program has detected existing data and offers the option to append new records.

data you are about to enter to or to replace the records already in RAWMAPS.

**Only one
location code
and year at a
time**

Should you choose to replace the records in RAWMAPS, you will be warned that the records you are replacing will be lost. On the other hand, should you choose to append, the program will verify that the location codes and the year you have entered match those in the records already in the file. You must only enter and process data from stations sharing a single Location code. In addition, to help keep track of data from various years, data from only one year can be entered at a time. Because between-record verification compares all recaptures with original captures, data from multiple years for a given location are merged together during that procedure (see Between-record Processing Section B.1., Appending verified

**Data Entry
Screen**



data files).

B. Entering Data

Once you have verified the location and year, the MAPSPROG data entry screen appears, which has the MAPS banding-data file structure given in Appendix I. To facilitate data entry, the on-screen order of the fields matches that on the MAPS data sheets very closely.

Note:

1. The field Note is a two-character field to accommodate note numbers greater than 9 ;
2. the field Time is a three-character field, as it is on the data sheet, containing only the

first three digits of the net-run time in 24-hour notation (thus, rounded to the nearest 10 minutes);

3. location and year, as entered earlier, are saved for each record automatically;
4. MAPSPROG allows you to enter data only into the fields included in the MAPS banding-data structure;
5. Enter data in capital letters only; turning on Caps-Lock on your keyboard is recommended.

You are now ready to begin entering your data. Once you fill a field with data, you are moved to the next field; to leave a field blank or to move to the next field before filling all the spaces in a field, press Enter or Tab. This is important for those fields, BS, PG, HA, HS, WNG, WEIGHT, and ONET, that are often not completely filled by the data on the data sheet; be sure to type Enter or Tab before entering data for the subsequent field. Pressing Alt-Tab will move you backwards field-by-field through the data screen, while the left and right arrow keys move you through the fields character-by-character. Using the mouse, the cursor can be moved to any desired field.

Saving records Your record will be saved and added to the file when you press Enter once you reach the final field, NF. Alternatively, to add and save the record, the first of the four buttons below the data entry fields, Add Record, can be activated with your mouse or by moving the cursor with the Tab key to the button and pressing Enter.

Whenever a record is added, the program automatically carries Band size, Page number, Status, Date, and Station as well as Band number increased by one (when C (code)=N, D, L, C, or A) over to the data entry screen for the new record, and the cursor is repositioned at SPEC. C (code) is carried over when C=N, R or U, but reverts back to N when C=D, L, C or A. Band number must always be entered as a nine-digit number (even for hummingbird bands). RAWMAPS will accept anything you enter into each field; the program does not begin checking the data until after RAWMAPS is transferred to the next file (TEMPMAPS).

Data entry screen buttons The remaining buttons offer some further functions. Clear All Fields clears the data entry screen of all data in all fields (except Loc) and repositions the cursor back at BS. This is useful mainly, for example, when switching from one band size to another or moving from new captures to

recaptures. On the far right, Return to Menu takes you back to the main menu bar. The Browse Records button brings up a window showing the records entered into the data file in browse mode below the data entry screen (see p. 17). This window allows you to both view and edit all the records you have entered. Be sure to use capital letters when editing data in the browse mode (turn on Caps-Lock on your keyboard).

**Browsing
entered data**

There are numerous features of the Browse Records mode that are helpful: for example, it allows you to review and modify data you have already entered; you can find your most recent entry when you interrupt your data entry session; and the record number lets you know how many records you have entered. Activating the scrolling arrows below and to the right of the window with your mouse or using the arrow keys on your keyboard allows you to move through and view all of the records in the file. As you move forward and backward through the file with the arrow keys, the data entry screen above will show the entire record highlighted by the cursor in the browse window. The mouse allows you to move freely between the upper screen and lower window simply by clicking above or below. Changes made in either place are saved automatically; however, changes made in one screen will not register in the other in real time. They will be shown in the other screen, though, once you move off the changed record and return to it.

While changes can be made to any field in browse mode, data entry is best accomplished in the data entry screen. The browse mode will not increase the band number by one, for example, when you down-arrow to a new record. The Return to Data Entry button sets up a new record for entry at the end of the file on the data entry screen.

You should enter all the data from the season before proceeding, but data entry sessions may be interrupted by exiting the program. Select Exit Program from the main menu bar and click on exit. Your data file, RAWMAPS, will be retained in your dedicated MAPSPROG working directory. For safety, be sure to back up the data you have entered by copying RAWMAPS.dbf to a floppy disk or other backup medium. **When you return to the program to continue data entry, be sure to select Append records in the location verification dialogue box.** Should you choose to Replace records instead, you will delete the records in RAWMAPS and begin entering data

Don't enter records into browse

into an empty file. For entering multiple years of data see Between-Record Verification of NEWMAPS Section B.1.b., Appending Unverified Data.

As you enter data, be sure to read the notes on the backs of the data forms and follow the important guidelines outlined in the following two boxes for marking certain special records: records of birds not captured during active MAPS banding at a MAPS net or station and

Mark non-MAPS captures

MARKING RECORDS NOT CAPTURED AT A MAPS NET OR STATION

Mark captures with uncertain species

Occasionally, notes associated with a record indicate that the species determination for a recapture or an unbanded bird was uncertain. Again, there is no evidence in the electronic data fields indicating this uncertainty. **Therefore, such records must be marked by putting QS in the Note field.** This will serve to indicate that the species determination for that record may be unreliable.

Occasionally, individual records that technically cannot be considered MAPS data are included on MAPS banding sheets. Such records might include birds found dead on a trail, under a window, or by a neighbor, or they might consist of banding a bird caught accidentally, not in a MAPS net or not even directly at your MAPS station. **Such records must be identified as non-MAPS data in order to avoid including such birds in constant-effort analyses. Therefore, please mark such records by putting NM in the Note field.** This is crucial, as there may be no other evidence in the electronic file indicating the non-MAPS provenance of such a bird. As all records require a station during within-record verification, it is appropriate to list your nearest MAPS station as the station for such records.

records of birds for which the species identification is uncertain.

C. Proofing Data

Printing your data

Once you have entered your data, you must proof the file for data entry errors. In the Enter Data menu, select Print data for proofing. The window that appears displays your entire data file and can be adjusted in size and resolution with your mouse and the View drop-down menu for convenient viewing. The arrow buttons at the bottom left of the window enable you to scroll through the number of pages indicated between the buttons; the simple arrow takes you to the next (previous) page and the arrow pointing to a line takes you to the last (first) page. Selecting Print from the File drop-down menu will send your file as you entered it to the default Windows printer in landscape format. Alternatively, use the printer button at the bottom of the window. Be sure to close the window (either in the File menu or using Close in the control box menu) before returning to the main menu; opening windows that are already open may cause the program to crash producing a Program Alert as explained under "Getting Started (C)", above; simply restart the program and continue where you left off.

Correcting data entry errors

Check the print-out of the data in RAWMAPS against your original banding data sheets to make sure all the records match. If in proofing you find you need or wish to make any changes to the data, select Browse/Edit RAWMAPS in the Enter Data menu. This pulls up a screen functionally identical to the composite data entry/browse data screen, allowing you to review all your records in browse mode and make any necessary corrections; your changes are saved automatically. The only difference is the absence of the Return to Data Entry button.

If you have discovered records that are missing in your computer file, return to Enter Data (Add Records) to add them. **Be sure to choose to append to the records already in RAWMAPS, rather than replacing them.**

Deleting superfluous records

Should you have duplicate records or other records to delete, select Ddelete a record from the Enter Data menu. The window that appears allows you to enter record numbers for records to be deleted. Type in the number of a record you wish to delete as listed on the data print-out or in the browse mode window and press the Retrieve and Ddelete This Record button. The screen displays the whole record for confirmation; you cannot make any changes. If the record is the extraneous one, proceed with the deletion as indicated by the warning and dialogue boxes. Once you have deleted a record, the remaining

This Record Retrieve and DELETE

Return to Main Menu

02	01E1	D12B	101E	BbC	22C	BbE	22E	11	BB	HD	0bb	01b	1E
1	3	11	1	5	28	133	300	0EVS3V133E	083	280E			
1000	0	1	11	50E000108	1000	5	21	0	5	0	0		

Record Number Showing 2

Delete extra
records all at
once

records in the file are not renumbered until you click the Return to Main Menu button. Thus, you can make all of your deletions using the record numbers on the print-out. **Once you are through, be sure to exit the Ddelete a Record window by clicking the Return to Main Menu button, since this is the procedure that will actually remove the records marked for deletion from the file and renumber the remaining ones.** Similarly, should you require to delete more records after deleting some and exiting the Ddelete a Record window, the record numbers on your print-out may no longer match those in

the file. Be sure to find the proper, new record numbers in browse mode or by printing the data once again.

D. Checking Banding Dates against Summary of Effort

**All records must
have date and
station**

One facet of verification, namely checking the banding dates of your stations as recorded in the raw data, is undertaken at this point. In the Enter Data menu, there are two menu options given under the Check banding dates against Summary of Effort heading. Selecting the first, Display station-date combinations, produces a screen displaying for each station all dates for which there is a record in your file. This report can be printed using the Print option in the File drop-down menu. It should be compared with your Summary of Effort sheets to make sure that all dates recorded in the data set for each station are dates on which banding actually took place at that station. Sometimes, dates or station codes may be incorrectly recorded on the banding sheets or, at those locations with more than one station, one or the other may be erroneously carried over from one record to another. Be aware that records with a blank in either field will also appear as an entry in the report. Such records will be brought to your attention again during the next step (transfer from RAWMAPS to TEMPMAPS), since all records, including those with code D, L, or U, must include a date and a station. To avoid the reminder during the next step, you should add this information at this point.

**Correcting
improper dates
and stations**

If you find that all the banding dates at each station recorded in the file match your Summary of Effort sheets, you may move on to the next step. However, should you find any erroneous stations or dates, station-date combinations, or blank stations or dates you wish to fill in, select the second option, List records for unique station-date combinations. This produces a dialogue box for you to enter the date (two-character month, two-character day, and four-character year; no slashes) and station for which you intend to inspect the records. The window that appears shows the record numbers of all records with that station-date combination and can be printed. These records should be checked in Browse/Edit RAWMAPS and against the raw data and should be corrected if necessary.

E. Transferring Data to TEMPMAPS

Once data entry, proofing, and correcting are completed, you are ready to transfer the data in RAWMAPS to TEMPMAPS, the file used by MAPSPROG to conduct within-record consistency

verification. Choose the final option, Transfer Data to TEMPMAPS, in the Enter Data menu. The program informs you when the transfer is complete. Once transferred, the data set is actually in both RAWMAPS and TEMPMAPS. The next step in the process, within-record verification, is conducted on TEMPMAPS. The raw data is retained in RAWMAPS just as you entered, proofed and edited it. This way, if you find you would like to start the within-record verification process over you can simply retransfer the data set from RAWMAPS. Other benefits of this system will be explained later.

DATA IMPORTATION

A.Data Importation Options

If, instead of entering data into RAWMAPS through MAPSPROG, you prefer to import data from another source, you may select from three options in the Import Data drop-down menu. MAPSPROG allows you to import data from a dBASE or foxpro file; an ASCII delimited file; or an ASCII columnar file which is a file in Standard Data Format (SDF), sometimes called System Data Format.

Data imported, like data entered, may replace or be appended to data already in RAWMAPS.

**Only one
location code
and year at a
time**

Location and year in appended data must match those in data already in RAWMAPS; discrepancies will block the append function. Also, the location in the import file must be unique; when importing a file, a location verification screen requests that you enter (and verify) a location code which it then compares with the location for the final record in your import file. If these do not match, you may elect to change the location code for all records in the file to the code you have entered or elect to reenter a location code that matches what is in your file.

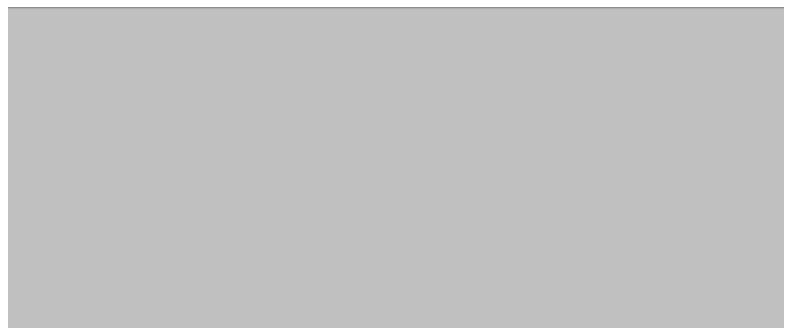
**Consult the
Data Entry
section**

Finally, before you import your data, be sure to read the preceding Data Entry section, since the notes in the beginning and all the functions and screens used for proofing and editing the data are identical for data entry and import.

1. Importing dBASE or foxpro files

**Make sure file
structures
match**

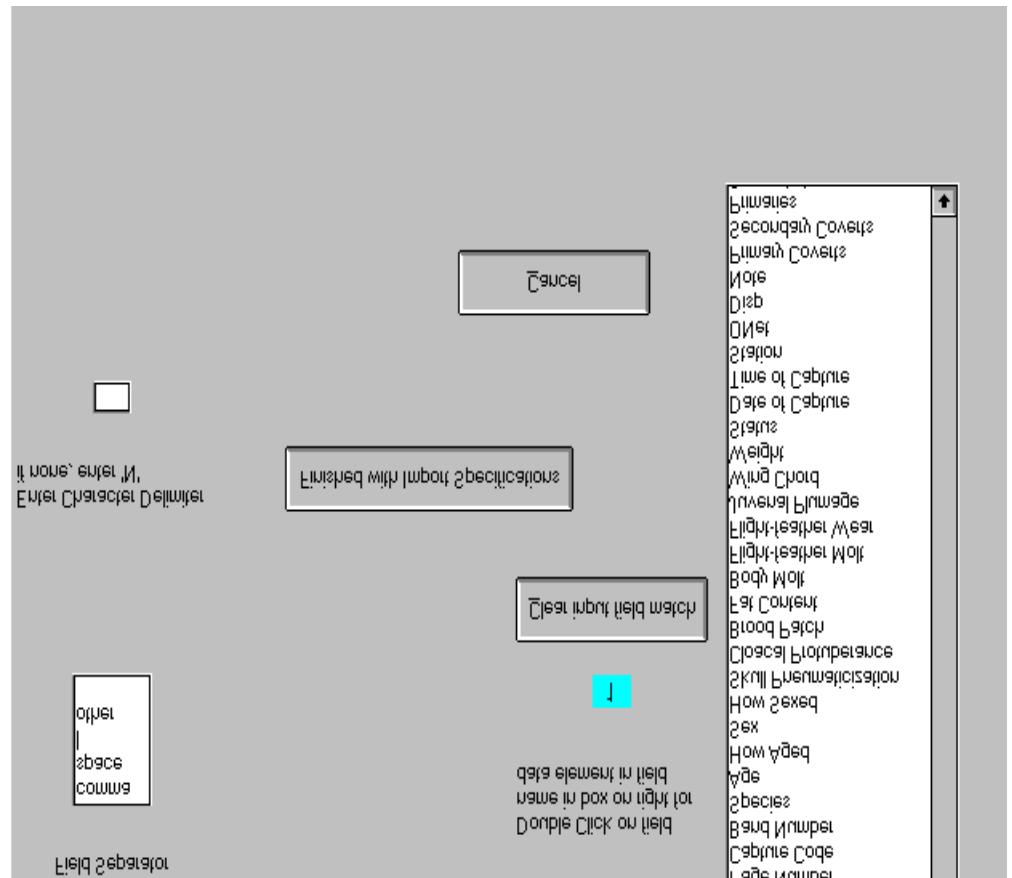
Importing dBASE or foxpro files is straightforward. Before attempting to load them, though, make sure they have the banding database file structure given in Appendix I to this Manual, with the same field names, types, and widths; otherwise, data will be lost in the transfer. Once you have matched the file structure, select Load a dBASE file already in MAPS format from the Import Data drop-down menu; under File Name: type in the full path and name of the desired file or use the visual directory to find and double-click on it. The program will then request verification of the file's location code, as indicated



under A., Data Importation Options.

Once you have entered a matching, standardized location code, click on the Proceed with Import button. Once the transfer to RAWMAPS is complete, the program informs you that it was successful. Should RAWMAPS already contain data, a dialogue box appears that lets you choose to replace or append your file to RAWMAPS. If you choose to append your file, any discrepancies in location code or year between the import file and the data already in RAWMAPS are brought to your attention and must first be resolved.

Loading an ASCII delimited file offers more flexibility in the structure of the file to be imported but is a more involved process, as it requires you to assign the fields in your file to the fields in the RAWMAPS file



structure. MAPSPROG will save your specifications, including field separator, character delimiter and field assignments for future reference. In the Import Data drop-down menu, there are two choices under Import a delimited file and convert it to MAPS format : Set up new parameters for import and Use saved parameters for import. Choosing to set up new parameters will display the following screen:

Once you have provided the information on the left side of the screen (total number of fields in the file you intend to import [15 fields are required for MAPS data], the field separator used in the file [often a comma], and the character delimiter to identify character fields [often double quotation marks]), you can begin assigning the fields in your file to the field names used in RAWMAPS. For each field in your database, identified by the number in the blue (shaded) box, double-click on the corresponding field name in RAWMAPS among the 37 fields constituting the MAPS banding database listed in the box on the right. Once you have

assigned data to a RAWMAPS field name, that name will be hidden to prevent you from assigning it a second time and to help you keep your place. Should you make an error, you can restart the assignation process by pressing the button, Clear input field match. When you assign a field to the Date field name, a dialogue box will ask you to enter the date format in your file using Y for year, M for month, and D for day. Any fields in your file that do not have a counterpart in RAWMAPS must be labeled for exclusion with the first item in the list, Not a MAPS Field. The remaining fields in the box are in the same order as for the MAPS banding database file structure given in Appendix I to this Manual. Make sure the width of the fields in your file match what is indicated there. This process is easiest if you can consult a written copy of your file structure.

Once you have finished assigning your data fields to the RAWMAPS field names, you can save the specifications you have entered. Click on the Finished with Import Specifications button. Then click Yes in the Save Import Specifications question box. Subsequently, click the Select File to Import button. Select the file you intend to import from the visual directory or type it out, including the path, under File Name:. Once you have made your selection, click OK and confirm with OK again. Double-click on the Import File button; the program will indicate that it is processing the data and eventually will let you know it has finished or, if RAWMAPS already contains data, will give you the option of appending to or replacing records already in RAWMAPS, after verifying the location code. If you would like to use previously saved importation criteria, select the second subheading under the Import a delimited file and convert it to MAPS format menu option, Use saved parameters for import. This will immediately provide you with the Select File to Import button, as above.

3. Importing SDF files

Importing data files in SDF format is similar to importing dBASE or foxpro files. Before attempting to load them, though, make sure they have the banding database file structure given in Appendix I to this Manual, with identical field order and widths; otherwise, data will be lost or garbled in the transfer. Once you have matched the file structure, select Load a standard data format (sdf) file in MAPS format from the Import Data drop-down menu. The rest of the procedure is as described for importing dBASE files, above.

B.Proofing Data, Checking Summary of Results, and Transferring Data

The remaining steps, proofing the data, checking the banding dates in the raw data against your Summary of Effort sheets, and transferring the data to TEMPMAPS, the first file used for data verification, are identical to those steps in Data Entry. To perform these steps, see the descriptions for steps C through E under Data Entry. For convenience, the same menu items in the Data Entry drop-down menu are repeated in the Import Data menu. Whichever set you use, they perform identical functions.

WITHIN-RECORD VERIFICATION OF TEMPMAPS

A. Preview

You have now transferred your proofed raw data into the second MAPSPROG file, TEMPMAAPS. **Any data corrections you undertake that are the result of within-record verification must be done on the records in the Within-Record Processing menu, which uses TEMPMAAPS; do not go back to the Enter Data or Import Data menus that use RAWMAAPS to make such changes.** This is important, since MAPSPROG keeps track of the source of errors, i.e., whether through within-record or between-record verification checks. Changes made to the data during Data Entry are not tracked.

The within-record consistency verification routine checks the data in TEMPMAAPS for valid codes and within-record consistency as explained in Section IV of the User's Guide. MAPSPROG bases its evaluation of validity and consistency on the data collecting protocols set forth in the 1998 revision of the *MAPS Manual*; it is likely to identify many more problems in data sets that do not adhere strictly to these guidelines than in those that do. Every error and discrepancy found by the routine generates a one-line message that informs you as to the type of error or discrepancy in the data. The messages are designed to help you look at your data critically in order to correct invalid codes or to reassess determinations in records which contain conflicting or unlikely data combinations. Thus, they generally identify the inconsistency and often offer a suggestion as to a change that might be appropriate. Discrepancies between two characteristics of a bird, (e.g., cloacal protuberance 3 and skull pneumaticization 2) often make it difficult to assign a reliable age to the bird. In this example, either the skull score or the breeding condition score is clearly in error, as young birds do not show breeding condition and adults do not show skull scores of two. However, **do not change the skull or the breeding condition score.** Those constitute field data read directly off the bird, and we can never be sure which characteristic was identified correctly and which was identified incorrectly; thus, these scores must never change. Determinations of age and sex, however, are inferences based on these data, and these may be changed in the database to improve the accuracy of the data; in fact, they *must* be changed. This is the basis for verification. In the example, if the bird was not aged 0 (unknown), the program will detect discrepancies and present you with messages indicating their nature, and suggest to you to research the age. Without further information, the age must be indeterminable and should be changed to 0. However, there may be other evidence, such as indicative molt scores or juvenal plumage scores, or a note, or knowledge you have about the bander, that allows you to make a confident age determination despite the contradictory scores. These contradictions may be quite difficult to resolve; your best judgment is required to know which conflicts are best left untouched in the data set and in which cases it is appropriate to modify the primary data. For more details and further examples please review Section IV of the Guide.

Error messages

Resolving inconsistencies

The checks in MAPSPROG are currently designed for breeding-season data

There are messages for critical as well as non-critical errors (Section IV). For your convenience, these messages are displayed separately during processing. All critical errors must result in some kind of change, as they reflect fundamental problems in the data such as invalid scores or impossible How Aged or How Sexed codes (for example, a juvenile bird can never be aged by skull if the skull is, in fact, completely ossified; S must be removed from How Aged, and, if S was the only ageing criterion used in such a case, the age determination itself becomes suspect). Remember, the verification routines currently embedded in MAPSPROG reflect only the time period of the MAPS season, May 1 to August 8. The verification checks may well be inappropriate for data collected before or after the MAPS season. Do not verify records collected during migration or winter banding using MAPSPROG 2.0. Furthermore, some of the messages reflect the newest information available in the 1997 Identification Guide to North American Birds by Peter Pyle; thus, for example, for swifts, cloacal protuberance is not a valid sexing criterion. In some other cases, information from the Pyle *Guide* has not yet been incorporated; thus, for those few species that show a complete first-prebasic molt, such as Bushtit, a message will appear when a juvenile shows symmetric flight-feather molt questioning the validity of the age. In this version of MAPSPROG, such messages for those species should simply be left unaddressed.

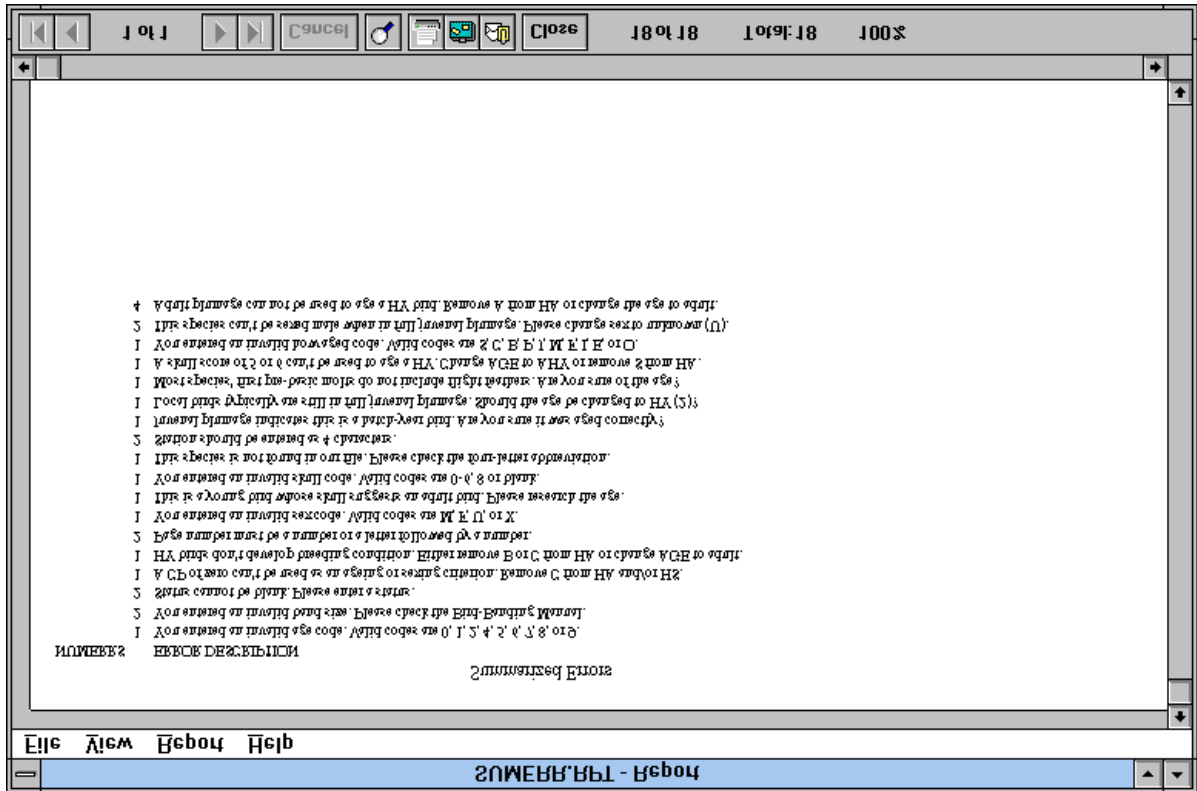
Non-critical errors are discrepancies in the data that represent unlikely combinations of supplementary data and primary determinations. In some cases, they may not identify errors at all, but simply represent unusual circumstances, as in the Bushtit example above. Juvenile Bushtits showing symmetric flight-feather molt are not in error at all, but simply represent a species unusual in that it shows a complete first prebasic molt. Thus, such messages do not always necessitate a change in the primary data; nevertheless, the discrepancy is identified with a message and the record displayed for checking. All non-critical messages ought to be reviewed and any problematic discrepancies addressed. To ensure that they are looked at, the verification module will prevent you from moving on to the next record without acknowledging them.

Improving data collection next season

Some messages identify conditions that cannot be modified in the current data set, but provide information or guidance as to ways in which data collection might be improved in future seasons to produce data that are as complete and useful as possible. Such messages include, for example: encouraging banders to use two How Aged or How Sexed codes whenever possible rather than just one; or filling in the time for every record. These messages are presented as a group before the actual verification routine; those that appear in numerous records are indicative of data collection techniques that would probably benefit from increased attention in subsequent seasons.

B.Operation of Within-record Verification

1. Viewing messages to improve data collection



Begin within-record verification by displaying messages that identify ways to improve data collection. Under Within-record Processing in the main menu bar, select the first choice, Messages identifying ways to improve data collection. The program will then give you an option to view, first, a list of the summarized errors and, second, a list of the individual errors. Clicking No will return you to the main menu. Clicking Yes will produce the appropriate one of the two lists displayed on the following page.

Should your data file have no room for improvement, a No error records warning box will appear; click OK twice, and the program will return you to the main menu. Otherwise, as with other lists, you may print from the File drop-down menu or using the printer button at the bottom of the screen; you can also enlarge or reduce the messages in the window using the View drop-down menu or the magnifying lens button. To move on, click Exit in the File drop-down menu or the Close button. Print out the summarized list as a reference at the start of the next season for identifying types of data collection problems that occurred with some regularity.

Summary lists always consist of a list of each error message generated and the number of records that generated that message, i.e., the encounter frequency of the error in your data.

Individual lists display the messages generated for each record.

2. Verifying within-record consistency

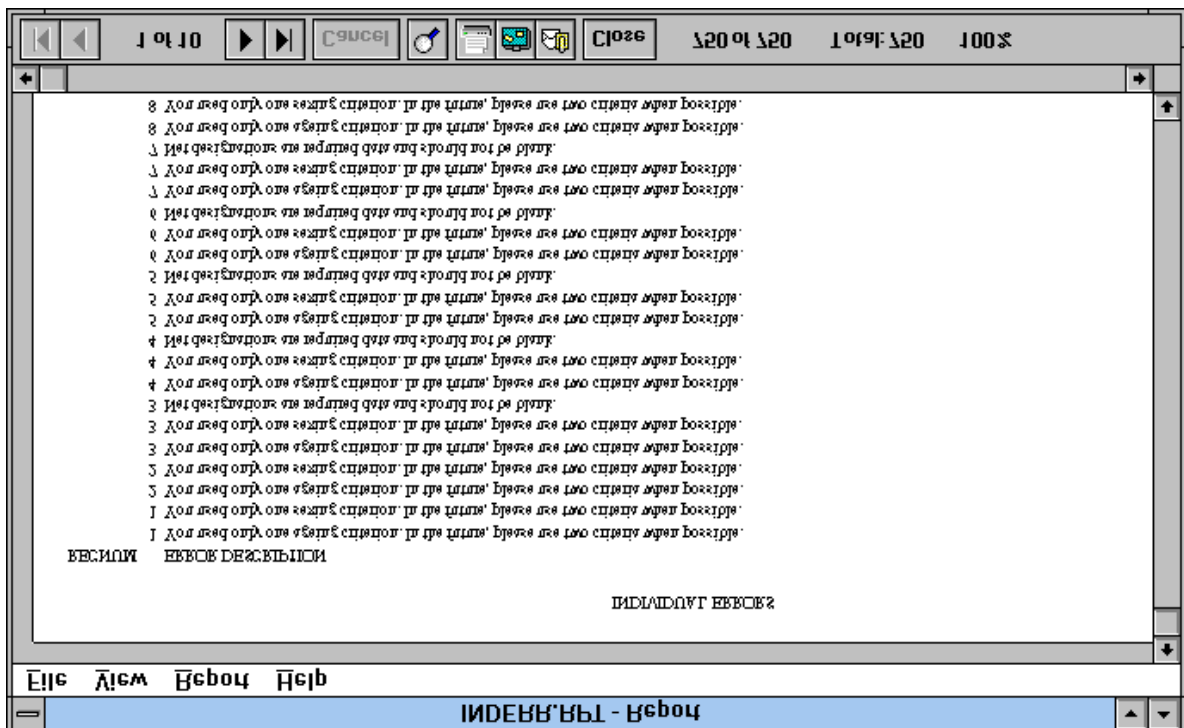
To move on to the next step, select the subheading Verify within-record consistency from Verify within-record consistency functions. The program then checks every record for internal consistency and automatically flags any records with discrepancies. A counter indicates that checking is in progress; once it reaches the end of the file you are returned to the main menu bar. The program can check about 200 records a minute on a Pentium, so with very large data files it may take the program a while--a built-in lunch break. The other options under Verify within-record consistency functions allow you to view the summarized list (indicating the number of records in which the problem was encountered) and individual list (indicating the problems in each record) of error messages generated during this complete verification routine. The lists will be stored with no changes until you reactivate Verify within-record consistency, even if you have processed and edited records in the meantime. A warning box appears when accessing the individual list that reminds you of this as well. For easy reference the lists may be printed out.

The summary and individual lists are saved

View the summarized errors list to familiarize yourself with the types of errors and discrepancies found in the data file. Users who import computerized data may find the summarized errors list particularly useful. The list identifies frequently recurring problems in the data set (such as the use of 9 for data not taken). Instead of addressing and correcting such errors individually in the next step, Processing, a global change to your data set (such as changing the 9's to blanks) could correct the error much more quickly. Note that if you enter or import a data set that makes use of codes other than MAPS codes, the verification

Making global changes to data set in your own database application...

...or in RAWMAPS (if you have dBASE)



routine is likely to generate a great number of errors. Global changes must be undertaken in your own database application, and the data set with the changes must be re-imported into RAWMAPS. Those who have entered data through MAPSPROG and have a database application that is able to use or convert .dbf (dBASE) files can make global changes in the data set in their own application. The appropriate file to use for making changes is RAWMAPS.dbf, MAPSPROG's data entry file. Exit the program (**Exit Program** in main menu bar) and make your changes. Then, you should re-import your data file into RAWMAPS to ensure that you have the proper structure (dBASE users may simply make their global changes in RAWMAPS, though the structure of the file must not be changed). When you import the changed data, you should **replace** the data in RAWMAPS when the query screen inquires whether you would like to add to or replace the data already in RAWMAPS. You should respond similarly when the corresponding query screen appears in transferring the data from RAWMAPS to TEMPMAPS (**replace** the data in TEMPMAPS). Once you have your revised data in TEMPMAPS, start over at the beginning of the within-record verification procedure.

**Data transfer:
Append or
Replace**

This situation demonstrates the flexibility of retaining the program's processing files, RAWMAPS, TEMPMAPS, and NEWMAPS, throughout your running of MAPSPROG while having the option of adding to or replacing those files as you move through the steps of the program. You always retain access to each of the files you have created in its most recent form yet have the option of replacing it with new data or adding new data to it. Clearly, if you add records to an earlier file such as RAWMAPS, you must retransfer the file to TEMPMAPS and replace the data in TEMPMAPS in order to end up with a complete TEMPMAPS file; that means any changes you made in TEMPMAPS would be lost and you would be required to begin the within-record verification process anew. A better way to add a few records, should that unusual need arise, is to **replace** your RAWMAPS data with only the new records to be entered and, in transferring to TEMPMAPS, to **add** those few records to the TEMPMAPS database.

**Making sense of
the messages**

If in consulting the error messages and during the subsequent processing, you find that you do not understand the reason for a message, please first make sure you understand the appropriate data-gathering guideline for the field in question by reviewing the relevant section of the 1998 *MAPS Manual*, Collection and Recording of Banding Data, pp. 20-38. If you find that the error message still does not make sense for the data in the record, you may have discovered a problem in MAPSPROG that we failed to encounter in testing. In such a case, please make a note of the data in the record and the message that came up and send it to us with your verified file.

Should the within-record verification routine generate no error or warning messages, both the summarized and individual error lists will show only a 0. In this unlikely event, you are ready to continue with the final step in the within-record verification process, transferring the data in TEMPMAPS to NEWMAPS (B.6., Transferring TEMPMAPS to NEWMAPS). In all other situations, you must move on to B.3., Processing within-record consistency errors.

3. Processing within-record consistency errors

Process within-record consistency errors provides two options: Process for the first time and Continue Processing started earlier. The second option allows you to interrupt a processing session without losing your place. If you are just beginning to process your within-record errors, select Process for the first time. A dialogue box will make sure that you have just completed a verification check, i.e., initiated Verify within-record consistency ; if so, click Yes. Then the within-record verification processing window appears with the first record that generates error messages; this window is shown on the next page. From top to bottom, it shows the record number, the entire record as entered or imported, three function buttons and two boxes with the associated critical and non-critical errors, respectively.

To process the record, follow these steps:

1. Read the messages displayed (if messages fill the message boxes, use the scroll bars on the right to view the hidden messages).
2. Identify and correct any invalid codes.
3. Find any remaining discrepancies or problems mentioned in the messages.

The screenshot shows a software window with a title bar and a menu bar. Below the menu bar is a list of messages. The first message is "Local birds typically are still in full juvenile plumage. Should the age be changed to HY (S)?". The second message is "Most species' first pre-basic molts do not include flight feathers. Are you sure of the age?". Below these messages is a "Suppress" button. Below the "Suppress" button is a "Non-critical errors" section. This section contains several error messages, such as "A CB of zero can't be used as an ageing or sexing criterion. Remove C from HA and/or H2." and "A skull score of 2 or 3 can't be used to age a HY. Change AGE to AHY or remove 2 from HA." Below the "Non-critical errors" section is a "Critical Errors" section. This section contains several error messages, such as "A CB of zero can't be used as an ageing or sexing criterion. Remove C from HA and/or H2." and "A skull score of 2 or 3 can't be used to age a HY. Change AGE to AHY or remove 2 from HA." Below the "Critical Errors" section are three buttons: "Next Record", "Re-edit record", and "Return to Menu". At the bottom of the window is a row of checkboxes and a row of labels: "CBC", "ZSC", "PB", "ZS", "TL", "BF", "HD", "UBB", "UBB", "IE".

4. Using your best judgment and keeping in mind the second, third and fifth rules in Section VI.E., make appropriate changes to the primary data fields. Again, no changes should be made to supplemental data. Remember, all critical errors require changes (often to Age, How Aged, Sex, or How Sexed). Non-critical errors do not necessarily require changes; but you must address them. To ensure that they are considered, they must be suppressed before you may proceed to the next record. To suppress a non-critical message, double-click on the **SUPPRESS** box for that message; when you do, the **N** in the box will change to a **Y**. (Hint: if the **SUPPRESS** box disappears, use the scroll bar at the bottom of the box to bring it back from the left.) To access the various fields of the record use your mouse or the **Tab** key.

Once you have finished editing a record, clicking the **Re-edit record** button will re-run the verification routine on the record *with the changes you have made*. Changes you make to primary data may, of course, result in new critical or non-critical error messages if new discrepancies arise. These will be displayed automatically and must be corrected if they are

Double-click on the **Suppress** box to suppress a non-critical message. **Y** indicates message is

critical or addressed (and suppressed) if they are non-critical. Continue the verification and editing cycle until no new messages, critical or non-critical, appear. Then click Next Record to save the changes to the record and to move on to the next record. The next record with messages is automatically brought up onto the screen; records without discrepancies are skipped. Should you click Next Record before all critical errors have been corrected and all non-critical errors have been suppressed, an **Errors Still Remain** box appears; this prevents you from moving on to the next record until all critical errors have been corrected and all non-critical warning messages have been suppressed.

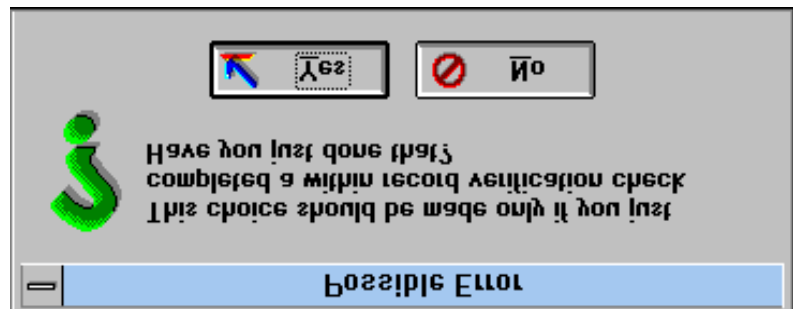
Retrieving records as originally entered

Occasionally, you may find in re-editing a problematic record that you wish to return to the record as it was before you began making changes. Since changes are not saved until you click Next Record you can retrieve the record as you found it when starting your processing by clicking the Return to menu button. Then, select the sub-heading Continue Processing started earlier from the **Process within-record consistency errors** menu item. The record in question is brought up again in its original form, along with the original messages. If you desire to return to an earlier record with no remaining critical or non-critical messages, use the next menu item, Edit a single record in TEMPMAPS by record number, discussed below.

Interrupting your work

Processing may be interrupted and MAPSPROG closed without losing the work you have done. Return to the menu and exit the program. When re-entering, be sure to select the subheading Continue Processing started earlier in the **Process within-record consistency errors** menu item; this will take you to the next record with messages that hasn't yet received your attention.

Selecting Process for the first time when you intend to click Continue Processing started earlier in the previous two paragraphs may necessitate restarting the verification process. While all corrections made to the data are saved, non-critical messages



remaining in the data would need to be suppressed again. Therefore, when you click Process for the first time, the warning box on the right appears, allowing you to choose No if you should rather select Continue Processing started earlier as indicated above.

4. Editing records in TEMPMAPS by record number

Returning to records corrected earlier

At some point in working through your file, you may wish to go back to a record you've already edited and purged: further consideration or other evidence may make you wish to reconsider determinations you left or put in a record. Those records can be accessed again by

selecting Edit a single record in TEMPMAPS by record number and entering the record number at the prompt.

5. Adding a record to TEMPMAPS: processing miscoded mortalities

Processing new captures that die at the banding station

There is one situation relating to miscoded birds that requires special handling. Some banders misapply the code D to new captures that die at the banding station after the band is put on the bird but before the bird is released. Such a record should be treated as an unbanded individual and the band should be scheduled as destroyed. However, sometimes such records remain on the page of new captures and are coded D erroneously. In such a case, you must first change the code from D to U and erase the band number; then you must add a record for the destroyed band (CODE= D and bird-related data left blank, see pp. 24-25 in the 1998 *MAPS Manual*) in order to schedule the band. In order to add such a record during within-record verification, select Add a record to TEMPMAPS from the Within-record Processing menu. This function is designed mainly for mistakenly D-coded records. Once you have entered the D-coded record, it is subjected to the within-record verification routine; critical errors and non-critical warning messages are displayed as in the within-record processing and must be corrected or addressed, respectively.

6. Transferring TEMPMAPS to NEWMAPS

Once you have completed the processing (the program will let you know when you have reached the end of the file), you are ready to transfer TEMPMAPS into NEWMAPS, the file used by MAPSPROG to conduct between-record consistency verification. The final option, Transfer data from TEMPMAPS to NEWMAPS, in the Within-record Processing drop-down menu performs this transfer. In transferring, the program conducts a final within-record verification to check for critical errors. If none is found, a series of pop-up boxes appears. The first, titled Transfer Records, makes sure you are ready to move on to NEWMAPS and between-record verification. The second, titled Transfer to NEWMAPS, indicates whether or not there are already records in NEWMAPS. As there will not be any records in NEWMAPS at the time of the first transfer, proceed by clicking the Transfer Records button. The third indicates that the records have been successfully transferred; click OK. The records are now in NEWMAPS and ready for the steps involved in between-record verification.

Once transferred, the data are actually in both TEMPMAPS and NEWMAPS, as in the previous transfer from RAWMAPS to TEMPMAPS. As you proceed with between-record verification on NEWMAPS, the data you verified and edited for within-record consistency are retained in TEMPMAPS.

As long as any critical errors identified by the within-record verification routine remain in TEMPMAPS, the program will not allow you to proceed to between-record verification. Should you, nevertheless, attempt to transfer the data to NEWMAPS, a warning screen will

appear informing you that critical errors remain in the data set. The usual sequence of viewing options for the summary and individual lists follows; at this point, however, only the critical errors remaining in the database are listed. Should you have critical errors in TEMPMAPS when you attempt to transfer, you have either not completed your processing or appended new records from RAWMAPS prior to transferring. Either re-run the within-record consistency check or print the individual list of records with critical errors and edit just those records by record number. Subheadings under the Transfer Data from TEMPMAPS to NEWMAPS allow you to call the error listings up onto the screen again.

BETWEEN-RECORD VERIFICATION OF NEWMAPS

1. Preview

This Preview outlines the steps involved in between-record verification and provides background information and tips to conduct the process smoothly. Between-record verification of MAPS data compares multiple records of the same band number (i.e., original banding, repeat, and return records) for data consistency among the records by inspecting the data for code, species, age, sex, date, status, and station as explained in Sections IV and V. Note that consistency for these fields entails a variety of meanings: for example, species and sex determinations **cannot** change from record to record, while age determinations and station data **may well** change among records, and code generally **must** change at least once from one record to the next, namely from N (new capture) to R (recapture). The checks embedded into the program take all of the possible permutations among records into account, including the possible changes in age in between-year returns. Clearly, to perform these checks effectively, the program must conduct them on a file that includes MAPS data from every season in which banding took place. Thus, between-record verification is initiated by appending verified data from previous MAPS seasons to the data you entered or imported and verified for your most recent season (step B.1.). NEWMAPS, the program's between-record verification data file, will then contain all of your MAPS data from all years of data collection.

The three subsequent steps serve to check and adjust or correct the field C (code): the program first adjusts records with changed or added bands, coded C or A (step B.2.); it then lists band numbers of recaptures with no original banding record in the database so that you can compare them against your band inventory and schedules (if, however, the band number appears three or more times as a recapture with no original banding record, it is assumed to be correct and is

not listed; step B.3.); and finally it lists those band numbers for which a recapture record predates the original banding record (step B.4.).

**Before
processing,
make sure your
records are
coded properly**

To track birds with changed or added bands accurately in the banding database, all records of an individual bird must show only one band number. The program makes these adjustments to the records automatically, once you enter the band numbers involved. However, the records must be included in the database exactly according to the instructions in the 1998 *MAPS Manual* on page 24 for changed bands and added bands. Review the *MAPS Manual* and Section B.2., below, to be sure your records are properly coded.

The next step ensures that band numbers with two or fewer recapture records and with no original banding record in the database constitute valid band numbers. Such records may represent birds banded outside of MAPS operation; birds recovered from another banding operation; or birds whose band number was recorded incorrectly, a common error. All of the band numbers appearing in the list must be double-checked to be sure they are not misread band numbers.

Finally, the band numbers of recapture records which predate the original banding record for that band number are displayed. These records must be checked and corrected, as they indubitably represent errors. Usually these records are again the result of misread band numbers; in other cases, the code R or the date may have been recorded improperly. In any case, these records must be corrected or marked as questionable before proceeding.

The lists produced in these steps often display records for which the band number may be questionable. Species, sex, and age inconsistencies between original captures and recaptures identified in the next step, Between-record verification, also sometimes represent misread band numbers. How to address possible misread band numbers and how to try to identify the proper original band number is discussed in the box Dealing with Misread Band Numbers.

Several of the checks in the between-record processing menu serve to identify misread band numbers: the numbers may lack an associated original banding record; recaptures of the band may predate the original banding record; the records may show conflicts in code (C); or the records may show blatant conflicts in species (or, in some cases, in age or sex) with other records with the same band number. Such blatant species conflicts would be, for example, a change from Gray Catbird to Wood Thrush. Sometimes conflicts between records showing unmistakable sex and/or age classes may indicate a misread band number, such as a change from an ASY male to an HY female Painted Bunting. For many misread band numbers, it has proven possible to associate the record in question with the proper original banding record by checking the band number against records with similar band numbers in your inventory and banding records. Any of the nine numbers may be wrong, but by checking your inventory, you can often be sure of the prefix (first four numbers) as well as the string (next three numbers). Then, consulting your raw data sheets or your proofing print-out, check to see if the data for your questionable recapture record match data (species, age, sex, skull, molting patterns and feather wear [taking date into consideration], wing, weight, station, net) for birds carrying bands with similar numbers. Remember that particular numbers etched into the bands, such as 1 and 7 ; or 6, 8 and 9 ; or 5, 6 and 9, often appear similar. If you can identify the original banding record, change the band number for the recapture record to match the original. If you have already run the between-record verification routine, you must run it again in order to compare the record with the reassigned band number to other records with that band number. Records that show unresolvable species conflicts or code inconsistencies must be marked as questionable (see B.6. Marking Records).

Once records with added and changed bands have been adjusted and out-of-sequence recapture records checked and corrected, your data are ready for between-record consistency verification (step B.5.). The procedure and lay-out for this step are similar to within-record verification. The program checks the data set for inconsistencies in the fields Code, Species, Age, Sex, Status, and Station among all records with the same band number. As before, error messages may be displayed in both a summarized and an individual listing. All the records identified on the individual list must then be checked and most must be edited. In some cases--in particular, when species conflicts arise (and sometimes with conflicts in age or sex as in the Painted Bunting example)--the underlying problem may be a misread band number in the recapture record. Again, see the box, Dealing with Misread Band Numbers, for guidance on correcting such records. Questionable records, for which species or band number remain unresolvable, must be marked using the program's marking routine. Once all erroneous records are corrected and all

unresolved records have been marked, the verification of your data is complete; no inconsistencies or conflicts unaccounted for should remain in your data. You are ready to produce files of your verified data for all years to submit on diskette or E-mail to IBP and for your personal use.

As you consider records from previous years in your record comparisons, be aware that those data were thoroughly verified and all within-record and between-record inconsistencies purged, using the techniques developed by IBP over the past ten years and which constitute the basis for the verification code used by MAPSPROG. To ensure that data from previous years contain no errors or inconsistencies detectable by MAPSPROG 2.0, we re-verified all of your MAPS data files through 1997 (that are enclosed with the program) using both the within-record and between-record routines in MAPSPROG 2.0.

Nevertheless, data verified in previous years will always have been verified according to ageing and sexing information current at the time of verification. Those standards are subject to change as new information and insights are published and disseminated throughout the banding community.

The new *Identification Guide to North American Birds, Vol. 1* by Peter Pyle provides a good example. Some of the newest information concerning appropriate ageing and sexing criteria published in the *Identification Guide* is incorporated into MAPSPROG 2.0 but was not generally available when data from previous years were collected and verified. Thus, modernized verification procedures may identify errors different than the outdated verification procedures from previous years did in otherwise identical records. When comparing such records during between-record verification, it is important to defer to the standards applied to the later data. For example, a Vaux's Swift sexed male by cloacal protuberance in 1997 would not have triggered any corrections during verification in that year; a record of the same individual recaptured in 1998, however, and sexed using the same criterion would be flagged by the program and the sex would end up as unknown, as CP is no longer considered a reliable sexing criterion for swifts. During between-record verification, these records will come up with conflicting sex. In such cases, because of the new information available, the sex for the 1997 record should then match the 1998 record and be changed to unknown. As acceptable standards for ageing and sexing continue to evolve, we intend to adapt the verification routines as well. Should you be privy to validated ageing or sexing criteria that contradict the information available in the *Identification Guide*--which is also the Bird Banding Laboratory's standard--

the appropriate How Aged and How Sexed codes should be 0 for Other and be accompanied by a note.

B.Operation of Between-Record Verification

1. Appending data files from previous years

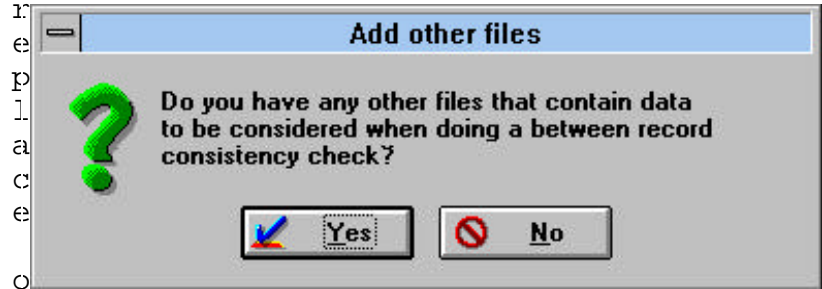
If there are MAPS data from previous years at your station(s), between-record verification steps should be conducted on a NEWMAPS file that includes MAPS data from all years. If you have available a current file of your data verified by IBP, follow the procedure described in B.1.a., Appending Verified Data Files. If you have unverified raw or computerized data from several years available and would like to verify all of it, follow procedure B.1.b., Appending Unverified Data.

**Use a. if you
have new data
from only one
season**

- a. Appending Verified Data Files
Once you have transferred your data from TEMPMaps to NEWMAPS and are ready to append data from previous years, select Append data files to NEWMAPS from the Between-record Processing drop-down menu. Windows' visual directory box, called Open Table, appears. Using your mouse, select the appropriate drive and file or type in the file and path of the file you would like to append. Clicking OK will append the file to your current data and sort the resulting NEWMAPS file by band number and date.

**Use b. if you
have new data
from several
seasons**

- b. Appending Unverified Data
Once your data from one of the years are in NEWMAPS (i.e., you have conducted within-record verification on one year of data and have transferred the file to NEWMAPS), you may begin data entry on another year of data. For security, you may elect to create a backup copy of the NEWMAPS database when presented with that option during the transfer from TEMPMaps to NEWMAPS. Then go back to data entry or data importing and repeat the steps through transferring data to NEWMAPS on another year of data, always choosing to replace the data already in RAWMaps or TEMPMaps whenever given the option to

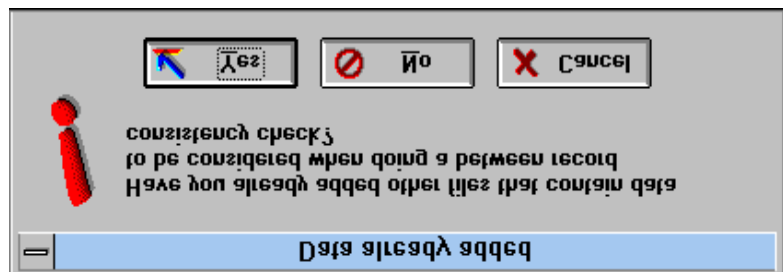


append. Once you have completed within-record verification on another year of data, select Transfer data from TEMPMAPS to NEWMAPS. At this point, elect to *append* your data to the data already in NEWMAPS when given the option. Repeat this process until all of your years of data have been appended together into NEWMAPS. You are then ready to proceed with a complete data file.

2. Processing changed and added bands

Once you have your complete data set in NEWMAPS, select the second choice in the Between-record Processing drop-down menu, Process all changed and added bands. Initially, a dialogue box, on right, will double-check to make sure you have added files from previous years, if applicable.

If you click Yes, the dialogue box for changed and added bands appears (next paragraph). Should you click No, the dialogue box on the right appears asking if you'd like to add data files:



Answering Yes will produce the Open Table box discussed in 1.a., above, Appending Verified Data Files. Answering No will provide you with the dialogue box on the right for changed and added bands with space to enter the old band number and the new band number. If you have no changed or added bands to process, skip to step 3., Checking recaptures with no original banding record.

If you do have changed or added bands to process, check your raw data or proofing print-outs for the appropriate band numbers. Indicate whether the records refer to changed or added bands by clicking on the appropriate circle associated with each phrase in the Process Added or Changed Bands dialogue box.

Enter the two numbers into the spaces provided. If you have changed bands, be sure to enter the removed band as Old Bandnumber and the new band as New Bandnumber. If you have added a band, it is best to enter the band just applied as the new band (it should remain readable longer); however, if you recapture a bird with two bands it should not make a difference which are identified as the old and new numbers. Once you have entered the numbers, click the Process Bands button. The program automatically changes the records to better track the individual birds.

Just for your
information:
when the
program
processes
records with
changed or
added bands,
it changes
the band
number for
all records
of this bird
to the **new**

band number.

Thus, all records in the database--including any future recaptures of that bird--will be tracked by the new band number.

Further, for changed bands, one of the duplicate C-coded records is changed to an R-coded record, while the other remains as a C record with the **old** band number in the BAND field; the C-coded record

identifies when that bird's band was changed.

For added bands, one of the duplicate A-coded records is changed to an R-coded record, while the other remains as an A record with the old band number in the BAND

field and the
new band
number in the
OBAND
field. Thus,
the record
coded A
serves to
associate the
two band
numbers
should, in
the future,
the newer
band fail to
be recorded;
the other
record, coded
R, serves
to track that
capture of
the bird in
the context
of its
capture
history.

**Proper
recording for
changed or
added bands**

If your file does not include the appropriate C- or A-coded duplicate records or if one of the records is missing, a message box will inform you of the problem. Review the sections on changed and added bands in the 1998 MAPS Manual, p. 24. In brief, this section explains that the capture during which a band is changed or the capture during which a band is added (or when a bird is recaptured with two bands) must be recorded twice on the data sheets: once as a recapture with the old band number and once as a new bird with the new band number (or twice as a recapture, once for each band number, if the bird was caught with two bands). The field C (code) for both records must read C if the bands were changed or A if a band was added. Thus, except for the band number, band size (data sheet type) and page number, both records must be identical. Should you find you need to make adjustments to existing records or add new C- or A-coded records, you must make those adjustments in TEMPMAFS and retransfer the file to NEWMAPS. Once both records are in the database correctly, the program will make the appropriate changes described above after prompting you for the original and new band numbers (or

simply the two band numbers on a recapture carrying two bands).

Consult your raw data and proofing print-outs to identify what changes need to be made in order to make the changed or added records conform to the correct pattern. Any changes that are necessary (records edited or added) must be made back in TEMPMAPS, so that the within-record validity of the records can be checked. To change records, return to Edit a single record in TEMPMAPS by record number in the Within-record Processing menu; to add a record, click Add a record to TEMPMAPS in the Within-record Processing menu. Once you've made your changes and additions, be sure to reverify TEMPMAPS and correct any problems identified in the changed or new records. Once errors are purged, retransfer the entire TEMPMAPS file with the changes and/or the new records to NEWMAPS. You should elect to *replace* the records in NEWMAPS instead of appending, so that you do not duplicate the records remaining in NEWMAPS. Once the corrected file is in NEWMAPS, repeat step B.1 of between-record verification, re-appending data files from previous years. Then proceed with processing changed and added bands. We recommend processing all changed and added bands at one time initially, in order to identify those records that need to be changed and/or added. If all changed and added records were entered according to MAPS protocol, you can move on to between-record verification directly.

3. Checking recaptures with no original banding record

In the Between-record Processing menu, select List band numbers for which there are only recaptures and the subheading List for Current year. Current year here designates the most recent year of data in your data file. This generates a list of record and band numbers from the *current* year for which NEWMAPS, your *complete* MAPS data set including your data from previous years, contains no more than two recapture records. These are recaptures without an associated original banding record. The list is displayed when you click Yes in the dialogue box after running the check and can be printed as in other message displays. If your data set contains no such records, a dialogue box appears, No Multiple Recapture Records for criteria ; simply click OK to return to the main menu. Band numbers that do appear on the list normally consist of bands applied outside of standard MAPS operations. They may also be recoveries from other stations, or they may be misread band numbers. If any

Check for
misread band
numbers

records are generated by this routine, please check the list against your banding schedules, data sheets, and/or band inventory to ensure that the band numbers are appropriate and have already been used. If band numbers are in this list that are not in your inventory of used bands, you must assess whether the number represents a recovery from another bander or a misread band number. Scrutinize records with similar band numbers for matching data (see box Dealing with Misread Band Numbers). If you have no similar band numbers with matching data, you most likely have a recovery from another banding station. Clearly, such records should be reported to the Bird-Banding Laboratory of the USGS/Biological Resources Division. You should correct invalid band numbers in the Edit records in NEWMAPS for between-record consistency option in the Between-record Processing menu (see below: 5.

Between-record Verification). In some cases, changes may be necessary to C (code); these changes also may be made in the editing mode.

The other subheading, List for previous years, displays recapture records with no associated original banding records from years *other* than the most recent. Activate this option only if the data set in NEWMAPS includes multiple years of *unverified* data, i.e., if you have appended into NEWMAPS data from multiple years that you entered or imported into RAWMAPS.

Users that received their previous years' data sets directly from IBP need not run this routine on previous years' data, and, obviously, those whose current data represents the first year of operation need not do so either (of course, those who list recapture records for previous years must *also* check recapture records for the current year). For those who have multiple years of unverified data, the procedure is identical to that described for the current year.

4. Checking recaptures predating their original banding record

Select List Recaptures that predate their new record from the Between-record Processing menu. This generates a list of band numbers for which the date recorded for a recapture of that band number (Code equals R) precedes the date recorded for the original capture of the bird receiving that band (Code equals N). This situation is rare but always represents an error. All of the records with these band numbers in the database should be checked and the problem identified and corrected. If your data set includes no such records, no band numbers will be displayed in the box under BAND. If there are such records, view all of the records sharing the band

number by selecting Edit records in NEWMAPS for between-record consistency in the Between-record Processing menu, entering the band number, and clicking the Get Records button (for more on using this function, see the next section, Between-record Verification). Check the dates of the records and find the records on the raw data sheets to help identify the source of the problem. Once you have found the source of the problem, make the appropriate corrections in the edit mode, following the instructions in the next section on editing records for between-record inconsistencies and saving changes.

5. Between-record verification

The next step consists of verifying the between-record consistency of the following fields: C (code), Spec (species alpha-code), Age, Sex, Status and Station. Initiate the between-record verification routine by selecting Verify between-record consistency of data in the Between-record Processing menu. Initially, the same sequence of dialogue boxes as in Process all Changed and Added Bands (step B.2.) appears, ensuring that you have appended your data files from previous years.

Once you have responded to that sequence of screens, the program performs the between-record verification routine on the NEWMAPS data file. In running the routine, it checks for consistency in the fields listed above among *adjacent* records sharing a band number; age consistency, however, is checked among *all* records sharing a band number since adjacent records may show no inconsistency even when non-adjacent records do. If no inconsistencies are detected between the records, a No errors dialogue box appears; click OK and proceed to C.

Creation of Final Verified Data Files. Inconsistencies are detected when two records with the same band number show conflicts in (i.e., impossible combinations of) code, species, age, or sex. Changes in status or station are unlikely and often in error and thus are also identified as conflicts. All records with an inconsistency are automatically flagged by the program for purposes of error-tracking; each inconsistency also produces an error message to help you identify and resolve the conflicts. As in within-record verification, these messages can be displayed in both a summarized and an individual list of errors. The summarized list indicates the number of times a given inconsistency between two records was encountered in your database (thus, an inconsistency between two records counts only once). The individual error list displays the messages identifying each inconsistency

**Print the
individual
errors list for
consultation**

encountered for each band number (not record number, as in

Return to Main Menu

+ -		+ -	
13	Inconsistent species: Is this a mistread band number? Check notes, measurements and other data	↑	
16	Inconsistent species: Is this a mistread band number? Check notes, measurements and other data	↑	
12	Inconsistent species: Is this a mistread band number? Check notes, measurements and other data	↑	
18	Inconsistent sex: Compare sex fields, preceding condition and wing for all records displayed	↑	
13	Inconsistent sex: Compare sex fields, preceding condition and wing for all records displayed	↑	
ВЕСИИИИ ВВВВВВВВ			
Errors			
+ -		+ -	
18	DENA B 1 B 502015421 WWA 1 BB E BB E 0 3 1 0 N S	↑	
13	DENA 1 1 B 502015421 WWA 2 2P M BC E 3 0 5 0 N 4	↑	
16	DENA B 1 B 502015421 OWA 1 2P M B E 0 0 5 3 2 4	↑	
12	DENA 1 1 N 502015421 WWA 5 21 U 3 0 0 1 3 N 1	↑	
Rec ГОСА В2 ВС С И ОВАНД ВАНД ОЗР ЗВЕС ОА АСЕ ОН4 Н4 О2 ОН2 ЗЕХ Н2 ЗК СР ВР Е ВМ ЕМ ЕМ			

within-record verification) and must be printed for reference as you proceed to rectify the inconsistencies (as before, select Print from the File menu [equivalent to Ctrl-P] or click on the printer button at the bottom of the window). All the records identified on the print-out must be checked and most must be edited.

Once you have your print-out of the individual error list, select Edit records in NEWMAPS for between-record consistency, the next option in the Between-record Processing menu. The box shown below appears, requesting the first band number for editing (the box is only partially

displayed here and a sample band number has been inserted):

Enter the first band number appearing on your individual summary print-out and click Get Records. Two boxes then appear in the window, one with all the records sharing that band number, the other displaying the messages associated with each record number. Because an inconsistency always occurs between data in two records, the error messages in the box generally appear in pairs, identifying the two records showing the inconsistency, the sex of records 17 and 18 for example. In cases in which inconsistencies are detected between three consecutive records--species in records 15, 16, and 17 in the example--the message is not shown twice for the record in the middle, which, technically, conflicts with both the previous *and* the subsequent one and thus could be listed twice.

Click the scroll bars on the side of the boxes with your mouse to view all of the records and messages; the scroll bar below the window containing records can be activated to view the remaining fields in the records. The records box contains all the records for the band number entered. This is important, as you will need to consult all records that share that band number in their entirety in order to reach a decision regarding any necessary changes. The only fields that may be changed in this step are Code, Band, Spec, Age, Sex, Status, Date, and Station. As in within-record verification, data read directly off the bird, such as pneumaticization score, molt patterns and fat, should not and, in this step, cannot be changed.

Messages identifying conflicts between two given records appear hierarchically, with only the most significant discrepancy displayed for each pair of records upon running the verification routine the first time. Thus, for example, species conflicts supersede age and sex conflicts which, in turn, supersede station and status changes. In the example depicted, records 15 and 16, caught in the same year, show only a species conflict in the message box, though their ages also conflict; if both records indeed refer to the same bird (i.e., if one of them is not a misread band number), then the age discrepancy will show up during re-verification once the species code of the incorrect record matches the other record.

Furthermore, for certain combinations of records for a given band number, not all conflicts in adult ages between non-adjacent records may be displayed initially. Therefore, to make sure all inconsistencies between records sharing a band number are addressed, the procedure is: 1) make corrections based on the messages displayed; 2) re-verify the records with the changes you have made and address any new errors that appear; 3) repeat this process until only inconsistencies in status and station among the records remain. If unresolvable

species conflicts remain (or unresolvable age or sex conflicts as in the Painted Bunting example in the box Dealing with Misread Band Numbers), the offending records must be marked; see B.6. Marking records, below. Should you make an entry in any of the fields that is not an acceptable MAPS code, messages will appear in the message box to alert you once you re-verify. Follow these steps to make changes and re-verify:

1. Type in the band number for the records you would like to check and click the Get Records button or hit Enter when the Get Records button is highlighted.
2. Read the messages that appear. Guided by the error messages and considering all of the information available in the entire capture history of that band number, assess the conflicts identified in the messages and determine how to resolve them: except for valid status and station changes, all conflicts must either lead to corrections in one or more records or the questionable records must be marked (see Sections IV and V and the fourth rule in section VI.E.). To assist you, the guidelines governing data consistency are summarized in the box on p. 44 Guidelines governing between-record verification editing. The messages generated by the program reflect violations of these guidelines exactly. You may find it easiest simply to correct the problems identified by the messages in the message box. However, should you experience uncertainty as to the nature of the inconsistency identified, consulting the guidelines may prove to be of assistance. Often clues in the raw data can help in correcting the problems identified: notes, the previous and subsequent records, the bander, the legibility of the handwriting--all of these may contribute to your decision concerning conflict resolution. Because changes may well result in new conflicts between other records displayed, be aware that changes in records other than the ones originally identified in the message box may ultimately be necessary.
3. Should you find no changes are necessary (i.e., there are only valid status or station changes among the records) and you

Assess the
conflict

If no changes
are necessary
enter the next
band number

would like to process the next inconsistency identified on your print-out, click the Enter next bandnumber button. This will return the cursor to the band number box and highlight the band number. Use the Backspace key to delete the band number and enter an entirely new band number, or use the mouse to place the cursor within the band number to alter just a few of the digits displayed. If you find records with species conflicts (or age and sex conflicts between unmistakable plumages) that are truly unresolvable, click the Return to Main Menu button and mark the records in question as described in the next section, B.6. Marking Records, before proceeding with between-record verification on other records.

4. **Make changes to appropriate fields, move off the record, and reverify the records**

Data can only be changed in the fields C, Band, Spec, Age, Sex, Status, Date and Station, those highlighted in blue on color monitors. (Data entry errors to other fields, which should have been corrected during proofing, must be corrected back in within-record verification; between-record verification steps, beginning with the transfer to NEWMAPS must be reinitiated.) To make a change to one of the listed fields, use your mouse or the arrow keys to select the problem field and make the change. **To save the change, you must move off the record you changed, either with the up or down arrow keys or by clicking on another record with your mouse.** Once you have moved off the record, click the Reverify records button; this will rerun the verification module on the records with the changes you have made. To mark a record with an unresolvable species conflict or an unresolvable age or sex conflict between unmistakable plumages (thus suggesting a misread band number), see Section B.6.

Marking records. Most species conflicts should be resolvable as misread band numbers while most age or sex conflicts are likely to resolve to an age or sex known for one or more of the records or to

Correct new errors until no new discrepancies appear

6.

unknown age or sex. To delete duplicate records see Section B.7. Deleting duplicate records. When faced with duplicate records, be sure to note the record number for the record to be deleted as displayed in the records box in the editing window, since you can only delete records by record number.

Once you click Reverify records, new messages identifying new or other inconsistencies may appear in the message box. Correct these, **remembering to move off the record to save the corrections**, and click the Reverify records button again. Repeat this process until the message box below appears, or until only station and status changes that you have already addressed or error messages identifying errors in records you have marked with a ? appear in the message box. For your convenience, N, the marking field described in B.6., is displayed directly after the field C. However, records must be marked using the protocol described in Section B.6. If the No Errors box appears, click OK.

7.

Then click on the Enter next bandnumber butt

on
and
ente
r
the
next
band



number from the individual error list print-out. If you begin making changes to a record and decide you'd like to start over again without saving the changes you've made, simply click the Return to main menu button before re-verifying the record and begin the editing process again. While it is not possible to start from scratch again once you have re-verified the record, the information originally in Band, Spec, Age, and Sex is always retained and available for consultation in the original fields (OBAND, OSP, OA, and OS)

whenever the data in the corresponding field are changed. Further-more, you can always reverse the changes you have made, should new conflicts brought up by a reverification routine make you reconsider a previous change. If a field contains a code equivalent to its O-field, it simply indicates that at some point there was some evidence suggesting that a change to the field was appropriate and that this conclusion was reversed upon further consideration or with further information in a new recapture record. It is perfectly acceptable, even desirable, for the database to reflect such progressions.

Use the information in the O (original) fields to help resolve conflicts

Common errors found in recapture data through the between-record verification routine are conflicts in species, age, and sex. For analyses, it is crucial that all records sharing a band number be identical in species and sex and show an appropriate progression in age. As you may notice during re-editing, when these fields are changed and the Reverify records button is clicked, the program moves the original data (taken in the field) into the respective OSP, OA, OHA, OS, and OHS fields. This is done so that these data are available in future between-record comparisons: this way, the data as entered on the data sheet are always immediately apparent. Furthermore, R is automatically entered into the HA and HS fields when AGE or SEX is changed. It is imperative that R remain in these fields in order to assess error rates. Be aware that species conflicts may be the result of either species misidentifications or misread band numbers. It is often helpful to consult raw data in order to compare other data fields and/or records with similar band numbers before making a decision about which error was involved.

Other errors identified by the between-record verification routine are duplicate records, errors in band numbers (as explained above), errors involving destroyed or lost bands that share the same band number with captured birds, and bands that changed status and/or stations. These are conflicts in C (and in C with respect to date), Spec (in those situations where the conflicting species identifications were correct and the shared band number was misread), Status and Station. Assess the conflict and determine what measure to take: whether to correct one or more of the records, to mark one or more of the records as questionable, or to leave the conflict in the case of valid status and station changes.

**Check OSP for
unidentified
birds**

In some cases, you may find that a record from 1997 or earlier appears with a species in conflict with a recapture from the current year. Records submitted to IBP with an unacceptable species alpha-code, such as SPAR (for sparrow sp.) or WARB (for warbler sp.), were given an acceptable but somewhat arbitrary alpha-code as a place holder, such as SOSP for SPAR. The original, unacceptable alpha-code will always remain visible in the field OSPEC and the N field will contain a ! to mark the species designation as questionable and to exclude the record from analyses. When such records come up, it presents a rare opportunity to resolve the identity of a record that has been a mystery up until then. If the mystery can be resolved, the ! should be removed from the record in B.6., Marking records. Occasionally, you may also be presented with the opportunity to correct records in which the N field contains a ? . If you can make such a correction, be sure to use the Marking records feature to remove the ? .

Once you have dealt with all band numbers listed on your individual error list print-out, marked all unresolvable conflicts, and deleted duplicate records, you are ready to move on to producing data files for IBP and your own use.

C : There must be no more than one N-coded record. D- and L-coded records (Code) may not share a band number with any other records. R-coded records must postdate N-coded records. C- and A-coded records must follow the guidelines described in B.2.

SPEC : The four-letter species code should be identical for all records displayed. If (Species) it is not and the true species identification of the bird in one or more of the records cannot be ascertained, the questionable record(s) must be marked (see Marking Records on p. 45).

AGE : Age determinations must be consistent within a year, and, for between-year recaptures, the progression in age must be logical. Thus, within a year, birds may change from 4 (local) to 2 (hatch-year) and back, but not from 4 or 2 to any after-hatch-year designation (1 [after-hatch-year], 5 [second-year], 6 [after-second-year], 7 [third-year] or 8 [after-third-year]). Likewise, within-year captures may not change from 1 or 5-8 to 4 or 2; neither may they vary between 5 and 6, nor among 5, 7, and 8. However, variation between 1 (after-hatch-year) and the more precise adult age codes (5 through 8) is not considered inconsistent, nor is variation between 6 and 7 or between 6 and 8.

Between-year recaptures, of course, must advance in age. Birds aged 2 or 4 cannot show a capture in a previous year. Those aged with any of the year-specific codes (2, 4, 5, or 7) may not show the same age in subsequent years. All birds must advance in age according to the following scheme: birds aged 2 or 4 in one year must become 1 or 5 the next; these must become 1, 6 or 7 in the next year; and in the year after that and all subsequent years, they must be 1, 6 or 8. A capture with an age of 0 (unknown) is considered inconsistent only with known-aged captures of the same band number *in the same year*; if the known-aged captures occur in subsequent years, the age of the unknown-age record must not be changed. When conflicts necessitate changes in records with specific adult ages (5 through 8), the age should revert to 1, the most encompassing adult age, unless information within the record justifies a change to another specific adult age, as indicated in the first paragraph on p. 29 of the 1998 *MAPS Manual*.

SEX : Sex determinations must not change among records. All records for a band number must show the same sex determination, M, F, or U.

STATUS : Changes in status from one capture to the next are not common and are thus worth investigating. For this purpose band numbers with status changes between records are displayed. Valid changes in status may remain in the data.

STATION : Changes in station within your location from one capture to the next are not common and are thus worth investigating. Sometimes, they may signal a misread band number, particularly if the stations are far apart. Therefore, band numbers with station changes between records are displayed and should be critically examined. Valid changes in station between records may remain in the data.

6. Marking records

Sometimes, conflicts in Code and Species (and occasionally Age and Sex as in the Painted Bunting example given in the box Dealing with Misread Band Numbers) remain unresolvable. The band number may actually have been recorded incorrectly, or the species may have been misidentified during one of the captures of the bird. In either case, if you harbor reservations concerning the validity of the species identification and/or band number recorded for one or more of these records, it (or they) must be specially marked in the database, as explained in Section V. To mark such records, select Mark Record with questionable species or band numbers from the Between-record Processing menu. The box that appears is similar to the Edit all records for a particular band number box that appears when editing NEWMAPS. Enter the band number of the records with the unresolvable conflict and click Get Records. As before, all records with that band number are shown, and the N field, the one used to mark questionable records, is displayed between the C and the OBAND fields. Identify the record or records which remain questionable and, using the mouse, place the cursor in the N field of the requisite records and enter a ?. Records that show no conflicts with others in species, age, or sex must not be marked, but note that when two records are in conflict, both of them need not necessarily be marked. Only one of them may be uncertain, particularly if there are further recaptures of the band number corroborating the determination given in the other record and it proved impossible to identify another record with matching data and a similar band number. To unmark a resolved record, simply delete the ? in the N field. **Be sure to use the arrow keys or the mouse to move off the record you marked or unmarked to save the changes you made.**

7. Deleting duplicate records

To delete duplicate records, select Delate a record from NEWMAPS in the Between-record Processing menu. Type in the number of a record you wish to delete from the records box in the editing window and press the Retrieve and Delate This Record button. The screen displays the whole record for confirmation; you cannot make any changes. If the record is the one you'd like to delete, proceed with the deletion as indicated by the warning and dialogue boxes. Once you have deleted a record, the remaining records in the file are renumbered once you click the Return to Main Menu button.

Thus, here (as opposed to during data entry or importing), you can make your deletions of duplicate records as you find them, because the record numbers are not printed on your error lists, but appear on the screen in the messages boxes as you verify and edit records sharing band numbers. **Once you have made your deletion, be sure to exit the Delete a Record window by clicking the Return to Main Menu button; this is the procedure that will actually remove the records marked for deletion from the file and renumber the remaining ones.**

3. Creation of Final Verified Data Files

Once you have completed between-record verification, the final step is to create, from NEWMAPS, data files for submission to IBP and for your own use. In the Final Functions menu, select Create a dBASE file to submit to IBP. This reinitiates the between-record verification routine. If critical errors (i.e., age or sex discrepancies or unmarked species discrepancies) remain in NEWMAPS, you will be informed that these need to be addressed before a file can be created.

Simply repeat section B.5., Between-record verification. When all critical errors have been rectified, the program then creates a dBASE file of NEWMAPS for IBP, named using the four-letter Loc code with the two-digit year for the most recent year of data in your database attached and a .dbf extension.

Please send the file as an attachment to an E-mail message containing your comments regarding your use of MAPSPROG 2.0 to pvelez@birdpop.org. Alternatively, copy the <LOC><YR>.dbf file onto a 3.5" diskette; label it with the file name, your name and the date; and send the disk, along with your comments, to Pilar Velez at IBP, P.O. Box 1346, Point Reyes Station, CA 94956-1346.

To produce a data file of NEWMAPS for your own use, highlight Create an ASCII or Delimited textfile from NEWMAPS from the Final Functions menu and choose between an ASCII or a delimited text file. As before, you are notified if critical conflicts remain in NEWMAPS. If your file is problem-free, you can produce either a text file or a comma-delimited file (with a comma as field separator and quotation marks as character delimiter) in the IBP data analysis structure, which contains the fields listed in Appendix II. You may use whatever name you like and store it wherever it is most convenient to you. **You must save a copy of this file in order to conduct between-record verification in future years.**

Congratulations! You have completed the MAPS data verification process! If you find you are having

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insurmountable problems in working with your data in MAPSPROG, do consider calling us at the IBP office, 415-663-1436. Pilar Velez and Dan Froehlich (email: pvelez@birdpop.org and dfroehlich@birdpop.org, respectively) are the biologists most familiar with the operation of the program and the User's Guide and Manual.

Thank you very much for all your patience, effort and help!

APPENDIX I: MAPS BANDING-DATA FILE STRUCTURE FOR 1998 DATA

Field	Field Name	Type	Width	Dec	Description
1	LOC	Character	4		Location code
2	BS	Character	2		Band size
3	PG	Character	3		Data page number
4	C	Character	1		Capture code
5	BAND	Character	9		Band number
67	SPEC	Character	4		Species alpha-code
7	AGE	Character	1		Age
8	HA	Character	2		How aged
9	SEX	Character	1		Sex
10	HS	Character	2		How sexed
11	SK	Character	1		Skull pneumaticization
12	CP	Character	1		Cloacal protuberance score
13	BP	Character	1		Brood patch score
14	F	Character	1		Fat content score
15	BM	Character	1		Body molt score
16	FM	Character	1		Flight feather molt score
17	FW	Character	1		Flight feather wear score
18	JP	Character	1		Juvenal plumage score
19	WNG	Numeric	3		Wing chord
20	WEIGHT	Numeric	5	1	Mass
21	STATUS	Character	3		Status upon release
22	DATE	Date	8		Capture date
23	TIME	Character	3		Time of capture
24	STATION	Character	4		Station code
25	ONET	Character	4		Net
26	DISP	Character	1		Disposition on release
27	NOTE	Character	2		Notes on data sheet
28	PPC	Character	1		Age class of primary coverts
29	SSC	Character	1		Age class of secondary coverts
30	PPF	Character	1		Age class of primaries
31	SSF	Character	1		Age class of secondaries
32	TT	Character	1		Age class of tertials
33	RR	Character	1		Age class of rectrices
34	HD	Character	1		Age class of head feathers
35	UPP	Character	1		Age class of upperpart feathers
36	UNP	Character	1		Age class of underpart feathers
37	NF	Character	1		Age class of non-feather parts

APPENDIX II: MAPS DATA-ANALYSIS FILE STRUCTURE FOR 1998 DATA

Field	Field Name	Type	Width	Dec	Description
1	LOC	Character	4		Location code
2	BS	Character	2		Band size
3	PG	Character	3		Data page number
4	C	Character	1		Capture code
5	OBAND	Character	9		Original band number
6	BAND	Character	9		Band number
7	NUM	Character	3		Species number (old BBS nos.)
8	OSP	Character	4		Original species alpha-code
9	SPEC	Character	4		Species alpha-code
10	OA	Character	1		Original age
11	OHA	Character	2		Original how aged
12	AGE	Character	1		Age
13	HA	Character	2		How aged
14	OS	Character	1		Original sex
15	OHS	Character	2		Original how sexed
16	SEX	Character	1		Sex
17	HS	Character	2		How sexed
18	SK	Character	1		Skull pneumaticization
19	CP	Character	1		Cloacal protuberance score
20	BP	Character	1		Brood patch score
21	F	Character	1		Fat content score
22	BM	Character	1		Body molt score
23	FM	Character	1		Flight feather molt score
24	FW	Character	1		Flight feather wear score
25	JP	Character	1		Juvenal plumage score
26	WNG	Numeric	3		Wing chord
27	WEIGHT	Numeric	5	1	Mass
28	STATUS	Character	3		Status upon release
29	DATE	Date	8		Capture date
30	TIME	Character	3		Time of capture
31	STA	Numeric	5		Station number
32	STATION	Character	4		Station code
33	ONET	Character	4		Net
34	NET	Character	2		Two-character net designation (conversions made by IBP)
35	DISP	Character	1		Disposition on release
36	NOTE	Character	2		Notes on data sheet
37	PPC	Character	1		Age class of primary coverts
38	SSC	Character	1		Age class of secondary coverts
39	PPF	Character	1		Age class of primaries
40	SSF	Character	1		Age class of secondaries
41	TT	Character	1		Age class of tertials
42	RR	Character	1		Age class of rectrices
43	HD	Character	1		Age class of head feathers
44	UPP	Character	1		Age class of upperpart feathers
45	UNP	Character	1		Age class of underpart feathers
46	NF	Character	1		Age class of non-feather parts
47	SC	Character	1		Skull check
48	CC	Character	1		Cloacal protuberance check

49	BC	Character	1	Brood patch check
50	MC	Character	1	Molt check
51	WC	Character	1	Flight feather wear check
52	JC	Character	1	Juvenal plumage check
53	OV1	Character	2	Original single-year verification code
54	V1	Character	2	Single-year verification code
55	VM	Character	2	Multi-year verification code through 1993
56	V94	Character	2	1994 multi-yr. verification code
57	V95	Character	2	1995 multi-yr. verification code
58	V96	Character	2	1996 multi-yr. verification code
59	V97	Character	2	1997 multi-yr. verification code
60	OVYR	Character	2	Original 1998 and later multi-year verification code
61	VYR	Character	2	1998 and later multi-year verification code
62	N	Character	1	Analysis suitability code
63	B	Character	1	Constant-effort comparability code for previous year
64	A	Character	1	Constant-effort comparability code for subsequent year

APPENDIX III: CODE DEFINITIONS FOR 1998 MAPS BANDING-DATA AND DATA-ANALYSIS FILES

Revised December 28, 1998

1. LOC: four-character location code (identifies national forest, national park, military installation or other location where a cluster of stations or single station is located and run by a single operator). Location codes are unique.
2. BS: Data sheet on which record was recorded:
New captures: band size
Recaptures: R
Unbanded birds: U
3. PG: page number of raw data sheet for that band size (or recapture or unbanded sheet) on which the record was written
4. C: capture code (codes L, D, C, and A indicate records that are not used in any analysis)
N - newly banded bird
R - recaptured bird
U - unbanded bird
L - lost band
D - destroyed band
C - changed band (duplicate recapture record containing the original band number)
A - added band (double-banded bird)
5. OBAND: original band number if BAND was subsequently changed during verification (Data-analysis file only)
6. BAND: band number
7. NUM: species sequence number (Data-analysis file only)
In general, these are old (i.e., obsolete) sequence numbers from the Breeding Bird Survey (BBS). Exceptions are numbers greater than 928 (the highest number in the original BBS sequence), which were created by IBP to handle taxa for which there were no BBS number. Examples of these are recent splits, taxa recognized by the Bird Banding Laboratory (BBL) but not given BBS numbers, and certain birds not identified to species. Some taxa recognized by the BBL and/or BBS were merged with others and given a single species number for analyses. These are
520 Northern Flicker (includes Red-shafted, Yellow-shafted, and Intergrade)
534 Traill's Flycatcher (includes Alder and Willow)
540 Western Flycatcher (includes Pacific-slope and Cordilleran)
608 Tufted Titmouse (includes Black-crested and Eastern)
654 Gray-cheeked Thrush (includes Bicknell's and Gray-cheeked)
736 Yellow-rumped Warbler (includes Audubon's and Myrtle)
748 Palm Warbler (includes Western Palm and Yellow Palm)
838 White-crowned Sparrow (includes Gambel's, Nuttall's, Puget Sound, Mountain, and Eastern)
840 Dark-eyed Junco (includes Slate-colored, Oregon, White-winged, Gray-headed, Pink-sided, and Unidentified)
8. OSP: original species alpha-code if SPEC was subsequently changed during verification (Data-analysis file only)

9. SPEC: species alpha-code
In general, these conform to the coding system used by the BBL, which reflects AOU taxonomy as closely as possible. Exceptions are gallinaceous species, for which BBS codes are used, and certain taxa not identified to species, for which codes were created by IBP.
10. OA: original age if AGE was subsequently changed during verification (Data-analysis file only)
11. OHA: original how-aged codes if HA was subsequently changed during verification (Data-analysis file only)
12. AGE: age (final determination)
 - 4 - local (young bird incapable of sustained flight)
 - 2 - hatch-year bird
 - 1 - after-hatch-year bird
 - 5 - second-year bird
 - 6 - after-second-year bird
 - 7 - third-year bird
 - 8 - after-third-year bird
 - 0 - indeterminable age
 - 9 - unattempted age (Banding-data file only)
13. HA: how aged
 - S - skull pneumaticization
 - B - brood patch
 - C - cloacal protuberance
 - P - plumage
 - J - juvenal plumage
 - E - eye color
 - F - flight feather wear
 - M - molt
 - I - mouth\bill
 - O - other (requires explanation in notes)
 - R - recapture information from between-record verification (Data-analysis file only)
 - U - used by IBP when HA is not provided or cannot be assessed from supplemental data (Data-analysis file only)
14. OS: original sex determination if SEX was subsequently changed during verification (Data-analysis file only)
15. OHS: original how-sexed codes if HS was subsequently changed during verification (Data-analysis file only)
16. SEX: sex (final determination)
 - M - male
 - F - female
 - U - unknown
 - X - unattempted (Banding-data file only)

17. HS: how sexed
- B - brood patch
 - C - cloacal protuberance
 - P - plumage
 - E - eye color
 - I - mouth\bill
 - O - other (requires explanation in notes)
 - T - tail length
 - W - wing chord
 - R - recapture information from between-record verification (Data-analysis file only)
 - U - used by IBP when HS is not provided or cannot be assessed from supplemental data (Data-analysis file only)
18. SK: skull pneumaticization
- 0 - none
 - 1 - trace (less than 5%)
 - 2 - less than 1/3 but greater than 5%
 - 3 - half (1/3 to 2/3)
 - 4 - greater than 2/3 but less than 95%
 - 5 - almost complete (greater than 95%)
 - 6 - complete
 - 8 - indeterminable, but attempted
19. CP: cloacal protuberance
- 0 - none
 - 1 - small
 - 2 - medium
 - 3 - large
20. BP: brood patch
- 0 - none
 - 1 - smooth (feathers lost)
 - 2 - vascularized
 - 3 - heavy (very heavily vascularized)
 - 4 - wrinkled
 - 5 - molting (growing new feathers)
21. F: fat content
- 0 - none
 - 1 - trace (furculum less than 5% filled)
 - 2 - light (furculum greater than 5% but less than 1/3 filled)
 - 3 - half (furculum 1/3 to 2/3 filled)
 - 4 - full (furculum greater than 2/3 filled but not bulging)
 - 5 - bulging
 - 6 - greatly bulging
 - 7 - very excessive
22. BM: body molt
- 0 - none
 - 1 - trace
 - 2 - light
 - 3 - medium

- 4 - heavy
23. FM: flight feather molt
N - no flight feather molt
A - asymmetric
S - symmetric
J - juvenal flight feather growth
24. FW: flight feather wear (outer 4-5 primaries only)
0 - none
1 - slight
2 - light
3 - moderate
4 - heavy
5 - excessive
25. JP: extent of juvenal plumage (body plumage only)
3 - full juvenal plumage
2 - greater than juvenal plumage but not full
1 - less than juvenal plumage but some remaining
0 - none, completely molted into basic plumage
26. WNG: wing chord (mm)
27. WEIGHT: mass of bird (g)
28. STATUS: status and additional information codes (see North American Bird Banding Manual (Vol. 1) for additional codes)
000 - not banded or bird died prior to release
300 - healthy bird banded and released
301 - healthy bird color-banded and released
500 - injured bird banded and released
501 - injured bird color-banded and released
29. DATE: date of capture (MM/DD/YR)
30. TIME: time of beginning the net run in which the bird was captured (to nearest ten minutes, e.g., 7:32 am=073, 24-hr clock)
31. STA: station number (Data-analysis file only)
32. STATION: four-character station code
33. ONET: up to 4-character original net designation (net in which bird was captured)
34. NET: 2-character numeric net designation used in analysis (Data-analysis file only)

35. DISP: disposition of birds upon release or after capture
 - O - old (healed) injury
 - M - malformed (deformity such as crossed mandibles)
 - W - wing injury
 - L - leg injury
 - T - tongue injury
 - E - eye injury
 - B - body injury
 - I - illness/infection/disease
 - S - stress or shock
 - P - predation (death due to predation)
 - D - dead (death due to causes other than predation or removed permanently from station)
 - " " - blank; bird released alive, uninjured
36. NOTE: designates if a note was written on the reverse of the banding sheet
 - N - note
 - #1-27 - note number
 - NM - not MAPS: record not from a MAPS station or a MAPS net
 - QS - species determination for a recapture or unbanded bird is uncertain
 - " " - blank; no note
37. PPC: age class of bird indicated by feather generations present in the primary coverts
 - 1 - tract is not indicative of a specific adult age class
 - 5 - tract contains some or all retained juvenal feathers, indicating a second-year bird
 - 6 - tract contains no retained juvenal feathers (or few juvenal feathers in non-passerines), indicating an after-second-year bird
 - 7 - tract contains few retained juvenal feathers, indicating a third-year bird
 - 8 - tract contains no retained juvenal feathers, indicating an after-third-year bird
38. SSC: age class of bird indicated by feather generations present in the secondary coverts
 - Codes as for PPC
39. PPF: age class of bird indicated by feather generations present in the primaries
 - Codes as for PPC
40. SSF: age class of bird indicated by feather generations present in the secondaries, not including tertials
 - Codes as for PPC
41. TT: age class of bird indicated by feather generations present in the tertials
 - Codes as for PPC
42. RR: age class of bird indicated by feather generations present in the rectrices, excluding central pair
 - Codes as for PPC
43. HD: age class of bird indicated by feather generations present in the head feathers (forehead; crown; nape; supercilium; eye ring; eye line; auricular; subauricular, submoustachial and malar stripes; and lores).
 - Codes as for PPC
44. UPP: age class of bird indicated by feather generations present in the feathers of the upperparts (back, scapulars, rump, and uppertail coverts)

Codes as for PPC

45. UNP: age class of bird indicated by feather generations present in the feathers of the underparts (chin, throat, breast, belly, sides, flanks, and undertail coverts)
Codes as for PPC
46. NF: age class of bird indicated by non-feather characteristics, including bill, mouth, eye, legs, and feet
 - 1 - non-feather parts not indicative of a specific adult age class
 - 5 - non-feather parts show some retained juvenal characteristics, indicating a second-year bird
 - 6 - non-feather parts show no retained juvenal characteristics, indicating an after-second-year bird
47. SC: skull check (if code present, record was re-examined for accuracy) (Data-analysis file only)
 - U - skull suggests age unknown, but age determined
 - Y - skull suggests HY bird, but AGE not equal to 2 or 4
 - A - skull suggests adult bird, but AGE not equal to 1, 5 or 6
 - 5 - SK=5, record re-examined
 - " " - blank; record OK, not re-examined
48. CC: cloacal protuberance check (if code present, record was re-examined for accuracy), arranged hierarchically (Data-analysis file only)
 - A - CP suggests adult, but AGE not equal to 1, 5 or 6
 - M - CP suggests male, but SEX not equal to M
 - U - SEX=M, but CP is blank
 - 1 - CP=1, record re-examined
 - H - AGE=0, 2 or 4, but SEX=M
 - P - SEX=M, but CP=0
 - " " - blank; record OK, not re-examined
49. BC: brood patch check (if code present, record was re-examined for accuracy), arranged hierarchically (Data-analysis file only)
 - A - BP suggests adult, but AGE not equal to 1, 5 or 6
 - F - BP suggests female, but SEX not equal to F
 - U - Pre-1997: SEX=F, but BP=" " or BP<>3 in species in which males develop BPs
 - U - 1997+: only used when SPEC=WREN and SEX=F; sex should probably = U
 - 5 - BM>2 and BP=5, record re-examined
 - H - AGE=0, 2, or 4, but SEX=F
 - P - SEX=F, but BP=0
 - 1 - BP=1 or 5, record re-examined
 - " " - blank; record OK, not re-examined
50. MC: molt check (if code present, record was re-examined for accuracy) (Data-analysis file only)
 - A - FM suggests adult, but AGE not equal to 1, 5 or 6
 - Y - BM+FM suggest HY, but AGE not equal to 2 or 4
 - " " - blank; record OK, not re-examined
51. WC: flight feather wear check (if code present, record was re-examined for accuracy) (Data-analysis file only)
 - A - FW suggests adult, but AGE not equal to 1, 5 or 6
 - " " - blank; record OK, not re-examined
52. JC: juvenal plumage check (if code present, record was re-examined for accuracy) (Data-analysis file only)
 - Y - JP suggests HY, but AGE not equal to 2 or 4

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" " - blank; record OK, not re-examined

53. OV1: original single-year verification code for a given band number if V1 changed during between-record verification (Data-analysis file only)
54. V1: single year verification for a given band number (if code present, record was re-examined for accuracy), arranged hierarchically (Data-analysis file only)
- 2 - two records with C=N and the same band number or two records with C=R and the same date, time and net
 - BN - band number discrepancy
 - SP - species discrepancy
 - NM - species sequence number discrepancy
 - A - age discrepancy
 - S - sex discrepancy
 - DL - destroyed/lost band and a captured bird with the same band number
 - ST - station discrepancy
 - SS - status discrepancy
 - " " - blank; record OK, not re-examined
55. VM: multi-year verification through 1993 (if code present, record was re-examined for accuracy) (Data-analysis file only)
- Same codes as V1
56. V94: 1994 multi-year verification (if code present record was re-examined for accuracy) (Data-analysis file only)
- Same codes as V1
57. V95: 1995 multi-year verification (if code present record was re-examined for accuracy) (Data-analysis file only)
- Same codes as V1
58. V96: 1996 multi-year verification (if code present record was re-examined for accuracy) (Data-analysis file only)
- Same codes as V1
59. V97: 1997 multi-year verification (if code present record was re-examined for accuracy) (Data-analysis file only)
- Same codes as V1
60. OVYR: original post-1997 multi-year verification code for a given band number if VYR changed during between-record verification (Data-analysis file only)
61. VYR: Post-1997 multi-year verification (if code present record was re-examined for accuracy) (Data-analysis file only)
- Same codes as V1

62. N: codes that designate whether or not the record is to be included in productivity and survivorship analyses (Data-analysis file only)
 The following codes mean record not to be used in productivity or survivorship analyses:
 S - not caught at MAPS station or in a MAPS net
 E - part of extremely irregular effort at site
 D - date outside of MAPS periods
 T - time outside normal MAPS operation for that station
 ? - uncertain species identification or band number
 ! - banded bird originally not identified to species; SPEC contains acceptable species alpha-code and OSP contains the original, unacceptable determination
 H - hummingbird
 G - gallinaceous bird
 U - unbanded bird released alive
 R - recaptured bird, but no band number recorded
 The following codes indicate record can be used in productivity and survivorship analyses:
 - - record examined with current MAPS analytical procedures
 + - record examined with preliminary MAPS analytical procedures
63. B: comparability to previous year (year Before), using constant-effort analysis (Data-analysis file only)
 The following mean records cannot be used in constant-effort productivity analyses:
 B - non-comparable, using net-by-net, hour-by-hour protocol (protocol used subsequent to 1991)
 M - non-comparable using net-by-net, hour-by-hour protocol; constant-effort analyses performed manually
 Y - non-comparable using net-by-net, period-by-period protocol (one protocol used prior to 1992)
 X - non-comparable using period-by-period protocol (another protocol used prior to 1992)
 The following codes mean record can be used in constant-effort productivity analyses:
 - - comparable by B or M protocol
 + - comparable by Y or X protocol
 The following code means no comparison possible:
 * - no comparison made; constant-effort analyses not completed between this year of operation and the preceding year of operation
 " " - blank; effort data not available; no comparison with preceding year possible
64. A: comparability to next year (year After), using constant-effort analysis (Data-analysis file only)
 Same codes as B (Item 63), except for B, and the following additional codes:
 A - (takes place of B) non-comparable using net-by-net, hour-by-hour protocol
 * - no comparison made; constant-effort analyses not completed between this year of operation and the following year of operation
 " " - blank; effort data not available; no comparison with following year possible